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DEVELOPMENT DIGEST

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URBAN PROBLEMS

It is increasingly recognized that much greater attention must be given to the urban component of national development plans if the cities are to remain a dynamic element of modern society. The immediate problem is to mitigate the poverty and squalor that threaten to strangle metropolitan growth. Cities like Calcutta, Buenos Aires, and Rio de Janeiro have already passed the point where curtailment of in-migration from the towns and countryside would enable them to cope with their exploding populations. Solutions must be found within the metropolis itself. Also, in the long run, the growth of new or smaller cities and towns could provide a decent life for the ever greater proportion of the population that is, and wants to be, urban.

Anatole SOLOW emphasizes the connection between urbanization and general economic development. David LADIN and Malcolm RIVKIN reflect an emerging consensus that the public environment—schools, hospitals, parks, public transportation, etc.—is the most likely point of attack on the seemingly intractable problem of urban slums. The potential importance of voluntary activity in this connection is underscored by the CALCUTTA METROPOLITAN PLANNING ORGANISATION proposal for an urban community development program.

On the long-run problem, Catherine Bauer WURSTER speculates on the relative costs of different patterns of decentralization, and Thomas CALLAWAY describes one attempt to create a "counter-magnet" to the capital city.

URBANIZATION IN LATIN AMERICA

Anatole A. Solow

[The problems associated with the "urban explosion" are particularly acute in Latin America but by no means confined to that continent. The author discusses some of these problems and outlines policy alternatives.]

National economic development planning is becoming an established governmental function in most Latin American countries. Yet, in preparing development plans, national planning offices have paid surprisingly little attention to the relatively recent, but important, phenomenon of the urban explosion. What are its effects and what planning strategy can be adopted to minimize possible negative by-products of urbanization on economic development or to maximize its positive aspects?

In Latin America, urban population increased by about 30 million during the last decade, from 65.5 million to almost 96 million people, and is expected to increase by another 42 million to a total of 138 million by 1970—double 1950. This represents an annual growth of between 4 and 5 percent as compared to a rural growth rate of only 1.5 percent and a total population growth of about 2.5 to 3 percent.

Furthermore, the population of large cities—over 100,000 people—has doubled during the past

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ten years and is growing at an annual compound rate of about 6 to 10 percent. These people require employment, developed and serviced urban land, industrial sites, transportation and marketing facilities, electric power, streets, highways, terminal facilities, water supply and distribution, sewage and refuse disposal, housing, schools, and many other types of public and community facilities and services.

One other characteristic of the geographic distribution of the growing urban population is of importance: the disporportionately large concentration of people in the capital cities and a few large metropolitan areas that are absorbing an ever increasing percentage of the countries' total population. All indications point to the continuation of these trends at least for the next decade.

The urban explosion is the result of a large rate of natural population increase combined with a continuing rural-urban migration.

Employment and Housing

Of even greater significance for the strategy of resource allocation is the qualitative aspect of the numerical increase, namely, the socioeconomic composition of the population in relation to resources. If the resources (capital, productive capacity, income) were in balance with the quantity of urban facilities and services needed by the growing urban population for the expansion of industrial and other productive activities, as well as for the maintenance of minimum levels of health, safety, decency, and amenity, the problem would be greatly reduced.

The principal characteristic of the Latin American urban areas is precisely that such a balance does not exist. On the contrary, the large majority of urban families have such a low level of productivity and income that they cannot possibly produce enough or pay for even the minimal urban services.

Even though an industrial worker in Latin America in 1950 earned three times as much as one employed in agriculture, a large part of this gain is offset by more rapid increases in costs of living in urban areas and the larger percentage of income which workers' families have to devote to food—usually 50 percent of their wages.

The uneven distribution of incomes is as serious a factor as the generally low per capita income.

It is clear that the total resources of the country and the productive capacity of the urban community are not nearly big enough to permit the amounts of subsidy required to bridge the gap between available resources and the needs for urban services, taking into

account the vast number of low-income, low-productivity families. Nor does the productive or industrial base of the cities expand in proportion to the growing number of urban people. In spite of the booming appearance of many cities, the creation of new urban jobs is not keeping pace with the increase in population.

The cost of providing facilities for the concentration of masses in large conglomerations is higher than in rural areas. In part, this is because the expectations of urban people are rising faster than rural, demanding more services and facilities; in part, because health and safety are more costly to protect under conditions of high-density urban living. Furthermore, the cost of living, the levels of consumption, and the costs of building and servicing in large urban areas are usually higher. In other words, the entire economic, social, and technological base of urban conglomerations is different from that of rural areas.

According to United Nations estimates, 1.5 million urban dwellings are needed each year for 30 years to overcome present deficits and meet population growth. At US$ 2,000 per unit the cost would be $3,000 million annually. If all the other essential urban and community facilities, utilities, and services were added to this, the investment required could easily be doubled.

Even now, vast capital sums, both internal and external, are being expended on urban infrastructure, even though planners consider this investment of low priority due to its relatively high capital-output ratio. It has been estimates that from 30 to 50 percent of all investment in Latin America is presently being dedicated to housing and related urban facilities. Indeed, economic theories notwithstanding, and perhaps as the result of political pressures based on "the revolution of rising expectations," vast amounts of capital resources have started to flow into the urban infrastructure sector.

This key issue of the growing discrepancy between the urban economic base and the costs of providing facilities is reflected, particularly during the past twenty years, in the formation of immense slum areas and entire squatters' towns. These are found on the periphery of urban areas, where the urban utility systems—especially water supply and sewage disposal, street paving, and schools—are wholly inadequate.

In the face of these problems, Latin American governments face two sets of policy decisions: 1) those directed toward urban problems, to achieve more balanced distribution and growth of large urban concentrations and to maximize their efficiency and minimize costs, and 2) those directed toward rural problems, to hold people on the land and to slow down rural-urban migrations.

Policy Alternatives

Policies on distribution and growth focus on three possibilities: 1) those that strengthen small and medium-sized urban areas; 2) those that concentrate public investment on a limited number of selected urban centers; 3) or those that would establish entirely new towns, especially in connection with natural resource development.

Although only a few countries have implemented definite policies, the importance of a regional approach is growing. The government of Guatemala has established a special office to study a national policy that would give impetus to urban regional centers in competition with the capital city. In the past five years, the government of Venezuela has formulated regional development policies and, with some success, implemented them. It has lent substantial effort to planning new towns in the Guayanas, where basic natural resource development is taking place. Puerto Rico has experimented with industrial-location programs designed to decentralize employment and population. In some countries, like Venezuela and Guatemala, administrative-financial institutions, such as national municipal development banks, are assisting the development of small municipalities away from the large urban centers.

Nevertheless, the centripetal attraction of large metropolitan areas for industry, capital investment, and population has proved difficult to counteract in practice. If industry is to be attracted to other than metropolitan areas, smaller urban areas must be enabled to compete in attractiveness. They must create superior public services, industrial buildings, and transportation facilities, and must be permitted tax exemptions. But all this presents inordinate problems. The more-or-less even distribution of public investments throughout large and small urban areas is costly; the positive effects are not accurately predictable; and the possible long-run benefits must compete with immediate results obtained through industrial investments in existing metropolitan areas.

In some areas where it has been tried, the indiscriminate dispersal of public resources throughout small urban areas has not proved practical. Puerto Rico's original decentralization program, providing factory buildings to small urban communities, attracted limited industry. Productive facilities would have had to be accompanied by utilities, housing, and community facilities to attract managerial and technical personnel; the amount of simultaneous infrastructure investments in many communities was prohibitive. In a revised plan, a few urban centers were selected in various parts of the island for concentrating and coordinating public investments, thus counteracting the pull of the San Juan metropolitan area.

A study of the location of industrial parks in Central America undertaken by the Stanford Research Institute, An Industrial Park Development Program for Central America [Menlo Park, Calif., 1964] went a step farther. While admitting that decentralization would be desirable, the researchers concluded that only the capital cities could economically provide the infrastructure needed to attract industries. Overhead public investment to make secondary cities attractive would be out of proportion with present resources.

Nevertheless, it would appear that a clearly defined policy of industrial development and location in development programs ought to encourage the growth of selected medium-sized and even small cities to the extent economically feasible.

Maximizing Efficiency and Minimizing Costs

Policies to encourage urban decentralization must be long-range. Meanwhile, development planners face the immediate problem of the continued rapid expansion of metropolitan areas.

Economic planners have tried to limit urban overhead investments to the minimum, on grounds of low priority. They argue that limited resources should be allocated to more "productive" activities and that, once production and income have increased, conditions in urban areas will automatically improve. Such postponement is not realistic. Urban conditions will continue to deteriorate and, owing to social and political pressures, increasing funds will continue to flow into urban infrastructure and housing facilities. Their inefficient use will put an additional burden on already limited resources. What is more, the growth of the productive and industrial sector may be retarded by inadequate urban support.

Thus, coordinated development policies for the entire metropolitan area become imperative to national plans. Even though little concerted action has been taken in this direction, awareness is increasing and various approaches are tried.

Perhaps the most urgent practical goal should be the greatest economy in application of funds to urban infrastructure and maximization of total return. A second important consideration is a more equitable distribution of benefits to lower-income groups. Here, the public sector may play a significant role.

To achieve these objectives, at least six approaches suggest themselves within the framework of a comprehensive metropolitan-area development plan: 1) coordination in time and space of sectoral investments such as water supply, housing, transportation, and schools, and the establishment of priorities for urban services;

2) setting of realistic standards at levels corresponding to economic development; 3) guidance of expansion within the urban area to achieve efficient land use and to minimize waste in urban services; 4) urban land reform; 5) harnessing and mobilizing local community resources; and 6) technological and managerial improvements to reduce costs.

The first two are intimately interrelated. In order to reach low-income families and to provide the benefits of limited resources to as many as possible, a number of public agencies are experimenting with new approaches to reduce costs. Instead of spending $5,000 or more per dwelling to build a limited number of heavily subsidized showcase projects as in the past, some communities are now limiting cost to $1,000-$2,000 per unit or even less through a reduction of standards, mass production and standardization, and rigid priorities. Core housing is a good example. This usually consists of a semi-finished shelter with roof and minimum sanitary facilities, which occupying families can further improve and expand.

A realistic appraisal of the growing squatter colonies and shantytowns has led some agencies to establish the following priorities: first, the provision of minimum lots within a well-laid-out land development plan which will reserve adequate land for streets and community facilities; second, water supply and sewage and refuse disposal; third, drainage and hard surfacing or paving of principal streets; fourth, provision of minimum essential community facilities; and, only fifth, a core or minimum shelter, in some instances this latter being left to the family to build as best it can.

The rationale is that the acquisition and efficient subdivision of large tracts of land with absolute minimum advance improvements will, at a minimum total cost, prevent the disorderly and overcrowded type of shantytown development which is extremely difficult to improve once it has been created. Thus, at least a minimum workable urban pattern would be established for the future.

However, many programs of this type have run into the problems of excessively high land-acquisition costs, unwillingness of owners to sell, and speculation in urban land which has driven prices so high that they are out of proportion to costs of other goods. Realistic improvements in urban development and large-scale minimum-facility programs for the benefit of the low-income masses depend on governments' facing the problem of urban land reform in order to force prices down or to permit acquisition within available public resources.

The haphazard and uncontrolled sprawl of residential, commercial, and industrial establishments into the countryside surrounding the urban nucleus, often skipping vacant land, generates pressures

for the wasteful extension of streets and utility systems. It increases travel distances and transportation costs, nullifying economies of scale. Sites for housing projects have often been chosen on the basis of availability of vacant land rather than suitability in terms of services and proximity to employment sources. On the other hand, the extension of public water supplies and highways has often been uncoordinated with the location of housing projects or the siting of industries. Only in a few instances have programs called for advance acquisition of large enough tracts of cheap land in suitable locations on the urban periphery where services and highways could be economically provided and industrial sites developed close to workers' housing. There are only a few cases of industrial land planning in which industrial parks have been located close to good transportation, electric power, and utility lines, thus providing cheap and suitable sites to attract industries. Yet only through a more rational land-use pattern in urban areas can substantial savings be made in public investment, space utilization, and transportation, thus lowering costs (and taxes) to encourage industrial growth.

Those few examples should suffice to demonstrate the importance of establishing comprehensive urban development policies as prerequisites for public investment allocations within the framework of national economic planning.

It has been said that "urbanization cannot be isolated from general economic development," but the reverse also holds: economic development planning cannot proceed successfully without concerning itself deeply with urbanization problems.

[Excerpted from "Urban and Rural Development in Latin America," by John P. Powelson and Anatole A. Solow, The Annals of the American Academy of Political and Social Science, Volume 360, July 1965, US$ 2.50, pp. 48-61.]

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URBAN GROWTH AND ECONOMIC STRATEGY IN LATIN AMERICA

David F. Ladin

[A somewhat different view of the problem discussed in the previous article is presented here. The author's views are his own and do not necessarily reflect those of the Organization of American States.]

Last year Latin America passed a major demographic milestone. As a continent, it ceased to be predominantly rural in character and, for the first time in history, the city population exceeded that on the farm. While it has taken centuries to reach this point, the trend towards urbanization is accelerating, and by the end of this decade the urban population may exceed the rural by as much as 20 million.

The main factor contributing to urban expansion has been the prodigious growth of the urban masses, but this has been strongly reinforced by rural-urban migration. In the 1950s, it has been estimated that some 15 million migrated to the cities; in the present decade, this movement will reach perhaps 20 million. As a result, urban areas are presently increasing at a rate of 5 to 6 percent. Slum areas in some of Latin America's capital cities are increasing by double or triple this rate, either through physical expansion of the areas or through additional overcrowding.

The reasons for the accelerated rate of urban migration seem fairly obvious. Per capita

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production and income in the urban areas are several times higher than those found in the rural areas, and in the last decade, while per capita rural incomes increased by about US$ 25 per year, the corresponding growth in urban areas was over $ 50, despite the absorption of millions of unskilled migrants. The second major reason that rural families migrate to urban centers is that social services of all kinds are more likely to be available to them, even in the more congested slum areas, than they are in the countryside. Available indicators show that school retention rates are higher, that health conditions are better, and so forth.

The major danger is that, because of the inability of the cities to absorb migrants at the present pace, continued immigration will dilute the present advantages that families find in urban areas. The social disorganization associated with Latin America's growing slums is widely discussed, even though it may not be too well documented. Two areas of paramount importance are especially noteworthy: one is the provision for adequate housing; the other, the creation of job opportunities.

With respect to housing, it is now estimated that 600,000 urban dwelling units are needed annually throughout Latin America to accommodate new family formation. To this figure might be added another 400,000 units to accommodate migrants from the rural areas, yielding a total demand of about one million units per year in the urban areas alone—a rate of housing construction that would approach that of the United States. Against these needs, Alliance-for-Progress-aided construction rates have barely exceeded 100,000 units, so it may be concluded that only one-tenth of the new needs are being met. The existing backlog of inadequate urban housing is estimated to be some 7 million units. Thus, current construction rates each year provide housing for only one out of each 70 families living in substandard conditions.

The employment problem is more difficult to quantify on a statistical basis, but it is a fair guess that, if unemployment and serious underemployment in the continent's urban areas could be matched against new job creation, the problem would, relatively speaking, be as acute as the housing situation.

Urbanization and Growth

The phenomenon of overrapid urban growth poses a real dilemma for planning economic development strategy. Urbanization, at least historically, has been part and parcel of economic growth and, hence, should be stimulated when more rapid economic and social development is the aim. On the other hand, a growing number of observers argue that, under present conditions, poverty is merely being

transferred from the farm to the city and that the appropriate economic measures would be those which might stem or slow down the present rate of migration. These latter arguments take many different forms, but basically they are aimed at one or both of two objectives: greatly expanded agricultural output and/or extension of urban facilities to rural areas.

Neither of these objectives is economically realistic. Expanded agricultural income either would require a reversal in the decline of agricultural prices relative to industrial commodities or would hinge on Latin America's capturing a larger share of the world market for these products. In the face of prospective increases in agricultural production in areas of the world that are now less developed than Latin America, neither of these hopes appears very certain. It is more likely that expansion of agricultural income in Latin America must await the slow growth of domestic demand.

Extension of urban facilities in the rural areas is also difficult to envisage. The very advantages that urban complexes hold for the more economical production of nonagricultural goods and services depend on precisely those urban attributes—such as concentrated markets, a concentration of labor supply, highly diversified inventories, and transport economies—which cannot be dispersed.

Possible Strategies

Some alternatives do exist, however—alternatives to slowing down the process of urban migration as well as alternatives to the type of urbanization which has been taking place in Latin America.

In the first place, urbanization need not be directed mainly or exclusively to the larger capital cities, most of which have already grown beyond the most economical size for the provision of public utilities and other services. Much attention has been given to regional plans to spur the development of new or satellite cities or to direct migration to existing urban areas of small or medium size. But with perhaps a few minor exceptions, no earnest attempts to provide the necessary economic base for such plans have been made.

Second, the housing plight of urban slum families might be ameliorated to a great extent by reorienting present low-cost housing programs. These are now aimed at providing new housing units for a small minority. Greater emphasis might be placed on upgrading existing structures and communities and on providing the urban majorities with a wide variety of essential public services such as potable water, electricity, sewerage, public telephones, and the like.

At the same time, the imbalance between the supply and demand for urban housing might be more rapidly overcome if more attention were paid to providing mortgage finance for the emerging middle-class families who would and could invest in private housing if such facilities were available to them. The shortage of middle-level housing is already estimated to be in the hundreds of thousands. In this connection, a vast expansion of mortgage guarantee programs of all types is needed.

An expanded construction program, not only of housing but of all types, would be a further alternative to present urban development trends. Special attention to this sector is warranted if for no other reason than that it is the only sector that can provide any substantial number of job opportunities for the unskilled farm laborer. There is little disagreement that in the long run urbanization must proceed and, therefore, that Latin American cities must be expanded. An appropriate economic strategy would match this need with the present availability of relatively low-wage unskilled labor, which, hopefully, will no longer be present a few decades hence.

[Reprint of a statement prepared for a Special Conference on International Housing and Urban Growth, Washington (D. C.), 22-23 September 1966, sponsored by the International Development Conference and the National Association of Home Builders.]

URBAN PROBLEMS: AN ENVIRONMENTAL APPROACH

Malcolm D. Rivkin

[A growing number of observers agree that radically new approaches to the problems of the city are required. Humanizing the metropolitan environment may be the most feasible way to attack these seemingly intractable problems.]

Two aspects of urbanization in developing countries are widely recognized.

First, dozens of countries are making a sudden transition from a predominantly rural economy and rural culture to a condition where the most dynamic and important elements of economic and cultural life are located in cities.

Second, a disproportionate share of this urban growth is concentrating in a few cities already large and beset with major difficulties. The waves of peasant migration make established centers their chief targets. Moreover, new industrial activities, commercial institutions, and cultural facilities are also gravitating to the metropolitan centers. Thus, metropolitan communities like Rio de Janiero, Lima, Lagos, and Calcutta—to name only a few—present the greatest sets of problems and opportunities in the developing world.

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Historical Lessons

Actually, these phenomena are well known in the history of development, for urbanization and economic and social development have gone hand in hand. When Western Europe and the United States were spurting to industrialization, they too experienced rapid shifts in population from towns and rural areas to already large, existing centers.

The process and its pitfalls appear inevitable, but some basic differences in the earlier experience must be pointed up. Studies indicate that a much higher proportion of the European labor force was employed in productive industrial activity during the comparable period of rapid urbanization than is so employed in developing countries today. Moreover, farm productivity was rising rapidly. A labor force could be spared for industrial and urban pursuits, and the farms could feed the cities.

Living conditions in European and American cities were pretty miserable, but the blossoming urban economies gave promise that this was but a transition phase. There was hope that the immigrants or their children would be moving on to a better life and, indeed, most of them did.

Today, in the countries with the worst urban problems, industry still employs comparatively few people and there are masses of urban unemployed and underemployed. Furthermore, in many of these nations, agricultural conditions are so bad that production and productivity are actually decreasing as surplus farm labor, often out of desperation rather than desire, flows to cities.

Development Means Urbanization

What then does this situation mean for the future?

First and foremost, the bad, unsanitary, and crowded conditions of the metropolitan centers, already horrifying to our sensibilities, will get far worse. There will be more "favelas" and "bidonvilles" and "gecekondu" crowding the outskirts of the metropolitan cities and spreading across the landscape. There will be slums, the likes of which the world has never before seen, on such a scale as to stagger the imagination. For, regardless of fond hopes, the costs of providing "decent, safe, and sanitary" housing and adequate services in the metropolitan centers of developing nations are prohibitive. I know of no nation in these circumstances that could possibly develop, no less devote, the amount of resources necessary to the task.

I think we have to accept this prospect for the metropolitan city of tomorrow in developing countries. There may be no fundamental

solution to the problems capable of execution. This acceptance, unpleasant though it is, may be the only way to map a realistic program of urban assistance in developing countries that will make the city of tomorrow somewhat better than it could be in the absence of such an approach.

I believe this prospect provides the basis for some sober, yet imaginative, development planning, and I should like to outline a few basic principles for the effort.

Concentrate on Countermagnets

For those public investments that are made outside the metropolis—in the interest of equity among regions or to open up new development areas—an intensive, conscious attempt to concentrate in a few key centers is required. Related investments in industry, education, housing, transport, etc., should be focused to give other communities some of the positive advantages of the metropolis, to combat its magnetism (so often false but nonetheless powerful), and to provide sufficient impetus for some self-sustaining growth to occur in less dense and congested—though definitely urban—surroundings than the metropolitan centers. This principle of "selective concentration" or "growth pole" development has captured much attention in recent years. The few projects under way are providing stiff tests for political and technical ingenuity.

Plan for the Metropolis

Within the metropolis, however, the most skilled activity in economic and environmental planning will be needed. The basic tasks, it seems to me, are to discover ways to strengthen its productive base and to upgrade the abilities of its people.

Programs should be established to pinpoint precisely what industries can best function in the metropolis. They should prescribe how to mobilize within the metropolitan framework what domestic and foreign resources are available; i. e., to obtain land, set up tax and other incentives, train workers for specific industries, etc. In effect, this means adapting techniques and procedures utilized in national economic planning to the metropolitan centers where major growth will perforce take place. Such metropolitan development planning differs markedly from the projections and land-use determinations of city planning as commonly practiced.

Humanize the City

Beyond programs of metropolitan economic development, I believe that public effort should concentrate its limited resources on

making a metropolitan environment conducive to human development. The objective would be to provide the best possible environment in which the migrant may develop skills and attitudes enabling him to become a productive member of an industrializing society; that is, to enhance his feelings of pride and to inculcate a sense of identity with the new metropolitan community at least as strong, and hopefully stronger, than his identity with the tribe or village left behind.

Insofar as facilities and services can provide these senses of pride and identity, public effort should focus on means of developing them. I mean such basic things that will make the environment more habitable: parks, play areas, and other open space; schools and other educational institutions; community centers and community facilities; new, flexible, and effective techniques of sanitation; provision of water; and transportation to work places. I speak of ways to humanize the monotony of mile upon mile of shanty towns and squatter settlements, to infuse these settlements with a modernizing presence that represents the nation of which they are now irrevocably a part.

It is particularly distressing to view the lack of what one might call humanizing facilities and services in the urban environment of the developing world and, at the same time, to review past history of overwhelming concentration on housing as the main object for both technical and financial assistance. Certainly housing is important. Without shelter, society dies. But housing in one form or another is that product which people of developing nations are best equipped to furnish for themselves—and do with a very large portion, if not the largest single portion, of domestic investment. True, advice and financial assistance are helpful, but the mass migration to the metropolis is far greater than any set of foreign-supported housing schemes and programs will be able to absorb. If it is a question of priorities (and I think any assistance program comes down to that), then the assistance provided to housing in metropolitan centers may really be marginal. If housing assistance is provided, far better that it be concentrated, along with other investments, in growth centers outside of the metropolis as part of a strategy to make such centers more attractive.

It is interesting to note that members of a Ford Foundation planning group in Calcutta have concluded that the Indian migrant has himself developed the most effective solution to the housing problem—the hut—and that public assistance can reach more people more effectively by concentrating on the environment in which the hut sits. [See "An Environmental Approach to Low-Income Housing," G. P. Van Huyck and R. C. Rosser, International Development Review, September 1966.]

Public Environment—The Key

The hut may not be decent or safe or livable by any formal housing standards yet articulated, but it is nonetheless livable by the standards of those who build it and who dwell therein. What is not livable, what is so debilitating to the human spirit and to the expectations and aspirations of those who flock to the cities, is the public environment outside the hut which provides little in the way of beauty, of kindness, of health and hope. It is not inside their houses that the peasants will learn the skills and attitudes necessary for a modern society but outside in the larger city and its facilities.

Kemal Ataturk sensed this, as the Turks built Ankara and other centers forty years ago. Parks where people could walk and relax and sense some nature were high-priority items for construction—along with community centers where they could learn. These were considered not luxuries, but necessities.

It seems to me that here is where the skill and the financial support of a nation should be applied most strongly; that is, in creating a tolerable public environment for the metropolitan city of tomorrow. Dollars placed in the creation of parks, of schools, of sanitation systems, of community centers, will go much farther and affect more individuals on a broader scale than comparable dollars in housing.

Indeed, I find it most interesting that the environmental approach is now being adopted by many people who are trying to deal with pockets of urban poverty in the United States and elsewhere. There is a growing recognition that slums are something much more than the houses people live in.

We will not be able to do too much in light of the intractable problems facing the chief centers of developing nations. But by concentrating on the environment itself we may be able to come a little closer to helping prepare urban people for the modern world, to provide a kind of richness in their barren, disappointing milieu, and to bring them to a time when existence in an urban jungle will really be but a transition phase to a better way of life.

[Reprint of "The City of Tomorrow," Ekistics, Athens Center of Ekistics, Athens, Greece, Volume XXII, Number 133, December 1966, US$ 0.50; originally presented to a Special Conference on International Housing and Urban Growth, Washington, 22-23 September 1966, sponsored by the International Development Conference and the National Association of Home Builders.]

AN URBAN COMMUNITY DEVELOPMENT PROGRAMME

Calcutta Metropolitan Planning Organisation

[This article is taken from a working paper submitted to the Government of West Bengal, India. Its suggested outline of an urban community program refers specifically to the needs of the Calcutta metropolis, but its emphasis on mobilizing existing community resources has implications for many other urban areas as well.]

It seems highly probable that "urban community development" will be one of the national themes to receive emphasis in the Indian Fourth Five-Year Plan. This interest and emphasis arise, of course, from an acute awareness that living conditions in urban areas appear to have got worse rather than better over recent years; that rapid urban population growth has increased the deficits and congestion of existing community facilities, particularly in health, housing, education, and transport; and that this deterioration has produced widespread frustration, hopelessness, and perhaps even despair.

Difficult and intractable as the problems of urban areas are, it is clear that any significant and sustained amelioration of living conditions can be brought about only by a combination of 1) major schemes of physical improvement carried out by government agencies and 2) the maximum possible voluntary effort on the part of the citizens.

The Calcutta Metropolitan Planning Organisation, established by the Government of West Bengal, India, in 1961, is the planning agency for the 490-square-mile Calcutta area, which encompasses a number of municipal and other kinds of political entities with varying degrees of autonomy.

A well-constructed programme of urban community development could make a useful and important contribution to meeting the following broad but essential goals. The emphasis of the following proposal is less on creating a variety of new councils at the neighbourhood level and more on adapting and developing existing institutions.

Mobilising Local Voluntary Organisations

The contribution of voluntary organisations to the development of Calcutta and to the improvement of neighbourhood living conditions is already great. For example, a survey of four wards of the Tollygunj area alone recorded 128 voluntary organisations covering a wide variety of activities and functions—welfare societies, sports organisations, education or health associations, neighbourhood committees, businessmen's clubs, trade unions, etc.—all, of course, run by committees of local, elected leaders. Seventy-eight sports clubs provide the only public recreational facilities and playgrounds that currently exist in Tollygunj, an area containing close to 250,000 people. Every single one of the 39 small libraries and reading rooms has been provided by voluntary effort. There are 20 clinics being run by voluntary agencies, as also seven primary and three secondary schools. These are simply examples of a pattern of voluntary achievement which occurs at the local neighbourhood level, with varying energy and enthusiasm, all over Calcutta city and throughout the municipalities of the metropolitan area.

To an important extent, however, these efforts suffer from lack of coordination and cooperation. They tend often to be sporadic in application, fragmented in organisation, uncertain in objective, and frequently unsuccessful through lack of resources. A basic objective of an urban community development programme would be to provide energetic government support to the existing voluntary organisations in order to help generate a "snowball of progress." The project organisation, focussing on a series of Community Service Centres, would provide the framework for coordination under the leadership of local citizens. The aim would be to build and develop on the basis of the existing community activities of local people and to set these activities in the perspective of a comprehensive city-wide development plan.

Strengthening Existing Leadership and Institutions

"Politics" are part of the inherent structure of the city, a proper and necessary ingredient of urban living. The only possible objective of urban community development must be to strengthen local, elected leadership and responsible civic government. Hence, the organisation of urban community development must be fully integrated

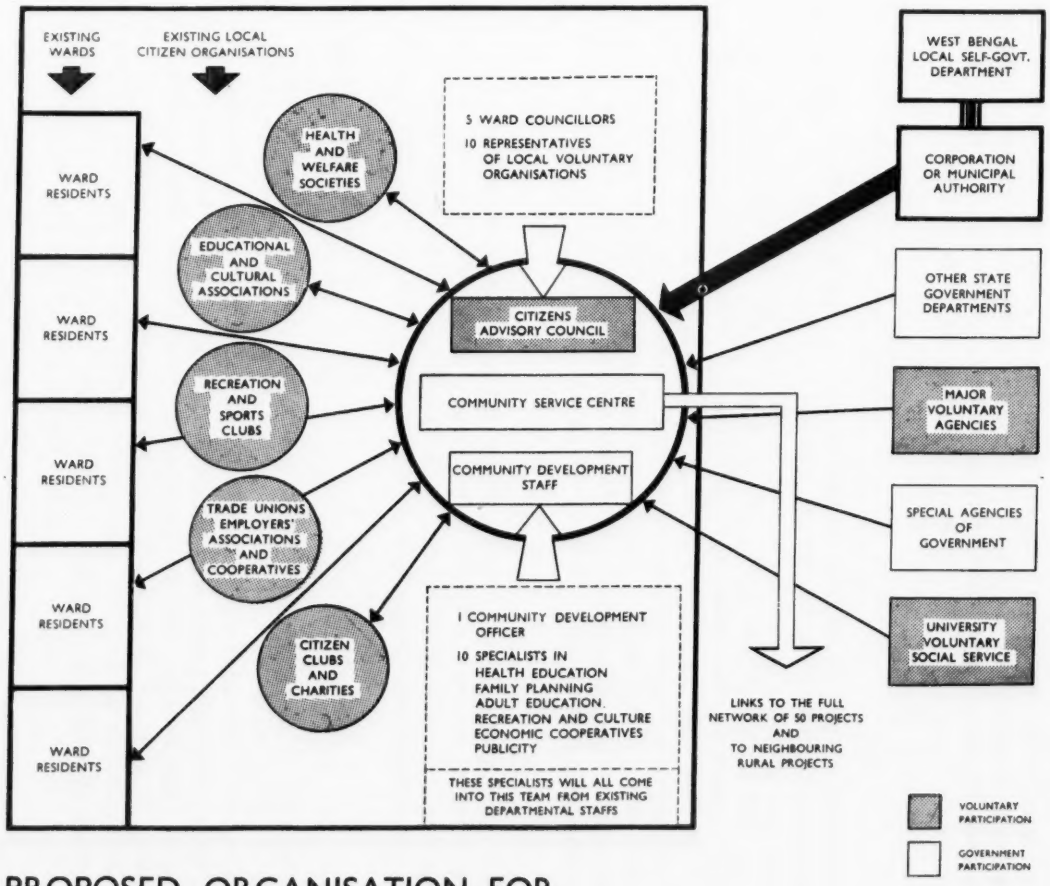
with existing democratic institutions; city councillors, etc., as local leaders, must be fully involved with specific leadership roles. It is precisely at the local level, say a grouping of three or four neighbouring wards, that there is the best possibility of strengthening civic leadership and instilling a sense of civic pride and responsibility in the individual citizen.

The technologies and administrative efficiencies of modern city management tend to encourage stronger centralisation of authority over increasingly wider areas. As major new "authorities" are established—for water supply and sewerage, highways and traffic, housing and redevelopment, metropolitan planning, and so forth—the gap between the administration and the individual citizen becomes wider and wider. The unconsulted millions cease to have, or fail to develop, any sense of personal involvement in the civic progress or any sense of personal responsibility for an individual effort at achieving improved standards of living. In this atmosphere of "remote control," it is not surprising that existing leadership should find difficulty in arousing popular support.

Being essentially organised at a local level, a community development programme would represent a major step towards the decentralisation of certain specific functions of local government, and thus towards a reduction of the gap between the administration and the public. Just as the technologies of modern city management in certain fields require larger and larger population units for administrative efficiency, so other functions of government are most effectively organised in relatively small units at the local level. This is particularly so in the case of certain health and welfare programmes, campaigns to eradicate illiteracy, and programmes of mass education generally.

A Coordinated Programme of Neighbourhood Improvement

In urban areas, the possibilities of major "self-help" by citizen groups are limited. People cannot lay their own sewers, build adequate drainage systems, build or widen major roads or bridges. They can, however, take many small but cumulatively vital steps to upgrade their immediate environments; to educate themselves and their families in improved standards of personal health and hygiene; to combine with their neighbours to secure better standards of performance on the part of municipal authorities; to develop or revive recreational, cultural, and social activities that could make life in urban neighbourhoods much more satisfying than it is now; to contribute welfare assistance for the weaker or deprived sections of the local community—in brief, to participate as citizens in an urban society which is being visibly, vigorously, and progressively modernised.


EXISTING WARDS
EXISTING LOCAL CITIZEN ORGANISATIONS
WARD RESIDENTS
WARD RESIDENTS
WARD RESIDENTS
WARD RESIDENTS
WARD RESIDENTS
HEALTH AND WELFARE SOCIETIES
EDUCATIONAL AND CULTURAL ASSOCIATIONS
RECREATION AND SPORTS CLUBS
TRADE UNIONS EMPLOYERS' ASSOCIATIONS AND COOPERATIVES
CITIZEN CLUBS AND CHARITIES
5 WARD COUNCILLORS
10 REPRESENTATIVES OF LOCAL VOLUNTARY ORGANISATIONS
CITIZENS ADVISORY COUNCIL
COMMUNITY SERVICE CENTRE
COMMUNITY DEVELOPMENT STAFF
1 COMMUNITY DEVELOPMENT OFFICER
10 SPECIALISTS IN HEALTH EDUCATION FAMILY PLANNING ADULT EDUCATION. RECREATION AND CULTURE ECONOMIC COOPERATIVES PUBLICITY
THESE SPECIALISTS WILL ALL COME INTO THIS TEAM FROM EXISTING DEPARTMENTAL STAFFS
WEST BENGAL LOCAL SELF-GOVT. DEPARTMENT
CORPORATION OR MUNICIPAL AUTHORITY
OTHER STATE GOVERNMENT DEPARTMENTS
MAJOR VOLUNTARY AGENCIES
SPECIAL AGENCIES OF GOVERNMENT
UNIVERSITY VOLUNTARY SOCIAL SERVICE
LINKS TO THE FULL NETWORK OF 50 PROJECTS AND TO NEIGHBOURING RURAL PROJECTS
VOLUNTARY PARTICIPATION
GOVERNMENT PARTICIPATION

PROPOSED ORGANISATION FOR
URBAN COMMUNITY DEVELOPMENT

To a very important extent, the existing effort—both on the part of voluntary societies and a multiplicity of government departments and agencies—is rendered less effective than it might be through lack of proper coordination at the local level. An urban community development programme would seek to provide a clear organisational framework. The headquarters of the project in each locality would become the local base for a single "package" programme of related projects—whether locally initiated or government-sponsored—with the single objective of raising the living standards of people who live in the surrounding neighbourhoods.

Emergency Relief and Welfare

From time to time, there arise situations of crisis and need which necessitate a rapid response on the part of both government and voluntary organisations if the acute human suffering involved is to get speedy relief. Over past years, Calcutta has had its full share of these human crises—floods, famines, destitution, civil disorder, the influx of refugees from East Pakistan. In each case, government welfare agencies and voluntary charitable organisations have responded promptly and generously. Here again, however, lack of coordination caused wasteful overlapping of effort and failure to use available resources so as to gain the maximum possible benefit.

It is not sensible to wait for emergencies to provide the right kind of organisation. The Community Service Centre in each urban community development project area would be the local field headquarters for the organisation, when necessary, of emergency relief.

Project Organisation

The essential feature of the project organisation would be the systematic involvement of all local voluntary associations, or as many as could be persuaded to participate, within the project area. These local voluntary organisations can be classified into five general categories: health and welfare societies, educational and cultural associations, recreation and sports clubs, economic associations (or local branches of associations) formed by employers or workers or members of cooperatives, and—as a residual category—citizen clubs and charities of all types.

The organisational task within each project area would be to identify and contact all voluntary associations, of whatever size, and to secure their cooperation in a combined effort of neighbourhood improvement and a vigorous and concerted campaign of mass education and social modernisation within the locality covered by the project. The leadership and coordination of this voluntary effort

would be provided by a local citizens council, supported by a small permanent community development staff of trained social workers. The headquarters of the council of local leaders and of the permanent staff would be a community service centre to provide the local rallying point for the efforts of people living in the surrounding neighbourhoods.

Appropriate Size of Units

One of the most difficult problems in designing the structure and functions of an urban community development project is the determination of the most appropriate area and population to be included within a single unit. To accomplish the objective of reinforcing civic loyalties, the community development project must be organised firmly and boldly above the "village" level of the small neighbourhood cluster. It should emphasise the need for community integration above the immediate neighbourhood level—and above the ethnic clustering which is so characteristic of Calcutta.

The community development project could provide the organisational framework for this essential integration if it emphasised significant civic loyalties at the "district" level of about 150, 000 population. This is the level at which an emphasis on the collective responsibility of neighbourhood citizens would help to strengthen representative government in Calcutta and encourage the emergence of civic concern and involvement.

This is also the level at which effective coordination of local voluntary organisations seems most practicable. A population unit of 150, 000 would generally contain a sufficient number of local clubs, associations, and societies—enough varied in size and function—to produce the kind of loose "alliance for progress" which the programme envisages, without the organisation's being dominated by any single group.

Thirdly, from the point of view of government-sponsored programmes in the fields of health, education, family planning, adult education, or social welfare generally, this would be the most effective unit for organising local field campaigns and for deploying and utilising trained staff. With the effective support of local voluntary organisations and the active participation of voluntary leaders and workers, only a small trained staff of community development officers would be needed.

Finally, a population unit of approximately 150,000 would enable the establishment of a direct relationship between the community development project and specific government agencies.

[Excerpted from "A Note on Urban Community Development as a Method of Government-Citizen Partnership for Improving Living Conditions in Metropolitan Calcutta," Improvement Programme for Metropolitan Calcutta: 1964-1971, Working Paper #17, Calcutta Metropolitan Planning Organisation, September 1964.]

OVERHEAD COSTS AND THE DEVELOPMENT PATTERN

Catherine Bauer Wurster

[This paper is an early attempt to specify, and in some cases quantify, the many factors involved in urban overhead costs. As the author points out, the cost "mix" varies depending on the urban pattern contemplated.]

"Decentralization" is a very vague term which can mean a great many different things: spreading suburbs, satellite communities, new independent towns of varied size and purpose, the expansion of existing small towns, village industry, the strengthening of local government in general, or entirely new forms and methods of development which have not yet been tried or even thought up. And if the physical pattern of urban and economic development really does have a significant effect on living conditions, improvement costs, and productive efficiency, then it is necessary to know what kind of pattern has what specific effects under a given set of conditions, and why.

Decentralization has been a major issue in many parts of the world for half a century or more, and one might expect that some systematic knowledge had been gained from the varied trends, policies, and experiments which have promoted it in one form or another. The fact is, however, that very little is known about the comparative costs and benefits of different development patterns.

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Some Evidence by City-Size Groups

If certain aspects of Indian cities are roughly compared, it appears that the biggest centers do seem to present the most difficult problems, whatever may be the cause, despite their continued attractiveness to rural in-migrants and economic enterprise.

The correlation between size and crowded living conditions is evident from some national survey figures.

Families living in one room or less:

Rural	34%
Urban	44%
Four biggest cities	67%
Calcutta (biggest city)	79%

Private outdoor space, an important factor in living conditions in warm climates, would, of course, decrease even more rapidly with city size. It is likewise evident that the opportunity for rural in-migrants to provide themselves with simple shelter by cheap traditional methods tends to decline as cities grow larger, for a number of reasons.

The proportion of the population residing in pucka [permanent] structures, with access to a clean water supply and water-borne sewerage systems, tends to increase with city size. But these benefits are none too prevalent even in the metropolitan centers, and, as far as health is concerned, they merely help to offset some of the evils and dangers that are caused by congestion. Despite better sanitation systems, medical care, education, and incomes, the crude death rate was higher in urban than in rural areas of India, as of 1954, although the differential was decreasing.

There are many indications that public costs per capita have gone up, and that they are higher in big cities—despite the evidence that living conditions are relatively worse. In rough terms, the per capita expenditure for the 13 big city corporations in India was Rs. 57, while it was less than half, or Rs. 25, for the 43 smaller cities. [In 1961, 1 Re. = US$ 0.21.]

How the Urban Pattern Affects Conditions and Costs

City size, in population terms, is only one of the significant factors. Density and area are just as important, and so is functional structure, particularly the relation between homes and workplaces. If the comparative costs and benefits of different patterns are to be weighed, the effect of these variables on specific elements in the urban environment must be considered.

Housing: The Effect of Density

City size, by itself, has little direct influence on housing costs. But the high land-prices and related accessibility problems which are often prevalent in large cities both tend to increase the required density of residential development. Density is a critical factor in the cost of housing construction.

Even in countries with the most advanced technology, elevator apartments are much more expensive per unit of floor area than low structures. But in India, the differences in housing cost due primarily to density and dwelling type seem to be much wider. In recent years, under the Works Ministry's standard regulations for a minimal one-room unit with sanitary facilities and balcony or veranda, the price range for typical examples would be about as follows:

In a four-story tenement on an expensive site at maximum density	Rs. 6,000 to 7,500
In a two- or three-story structure on moderate-priced land	Rs. 4,000 to 5,000
In a one-story structure on cheap land, in smaller towns or in the outlying fringe of larger cities	Rs. 2,500 to 3,500

These costs are for ordinary contract construction. Under the Slum Clearance Program, however, local authorities have been encouraged to provide plots with pucka sanitary facilities and a supply of kutcha [impermanent] building materials, for more-or-less self-help construction. With space standards often above the minimum, these units cost only Rs. 900 to Rs. 1,500. Of course, they are only feasible where very cheap land accessible to employment is still available—a rare and diminishing resource in all large cities. Density appears to be the most significant factor—probably because, in general, higher densities mean dwelling types which require increasing dependence on modern materials and technology, and skilled labor and supervision, which in India are all relatively expensive, sometimes imported, and often in short supply.

However, low-density housing can utilize various noncompetitive and nonmonetary resources: the homeownership incentive to invest labor and savings otherwise unproductive; kutcha material (which a minimum of technological ingenuity might improve); unskilled in-migrant labor with knowledge of traditional building methods; and the Indian climate, which makes private outdoor space useful for many family activities and makes traditional methods of construction and design more suitable in many cases than imported Western practices.

Housing is by far the biggest factor in urban overhead costs, but community facilities such as schools, hospitals, parks, and playgrounds are affected by the same influences. If tolerable urban living conditions are to be achieved at reasonable costs, it seems likely that planning for low-density development will be an important prerequisite, besides a substantial program of public land acquisition or other controls to prevent speculative price rises.

Sanitary Facilities: The Effects of Size and Density

The two major elements, water supply and excreta disposal, must be considered separately although they are interrelated.

Apart from geographic variables, increased city size and density probably tend to make for economy in a water distribution system, up to a point. To some extent this would also be true for a piped water-borne sewerage system, although a large, expanding urban area is likely to meet with increasingly serious and costly problems of disposal. For any alternative method—septic tanks, "aqua privies," pits, composting, night-soil collection—relatively low density is usually an essential factor in its feasibility for decent and healthy urban living. Under suitable conditions such methods may be economical, particularly in their demands on skilled labor and high-quality industrial products, and as a means of conserving water. The fact that science can improve the simpler systems without losing their economical advantages is evident from the Japanese experience.

Size and density can, therefore, work both ways to some degree. Although housing is a much larger item in urban overhead expenditures than sanitary facilities, the latter are a major factor in municipal budgets.

Transportation: The Effects of Size, Density, and Functional Structure

Getting from home to work is an important element in both family and public budgets, and in productive efficiency. The journey to work is greatly affected by the urban pattern in several different but interrelated ways. In so far as more population means going a greater distance to work, city size makes for a rapid increase in costs, both to the worker and to government. More mileage means a shift from walking (free, except in time and energy cost), to bicycle (a considerable investment for many low-income Indians), to bus (fares, plus subsidy, plus better roads), and finally to expensive rail lines in many cases. Commuting by private automobile is still infrequent in India, but it is already producing new traffic problems and rising highway expenditures. The transportation item is

usually the biggest single factor in the high per capita budgets of big cities.

The effect of size on transportation costs is qualified, however, by two other factors. One—high density—makes for economy until traffic jams begin to counterbalance geographic proximity. The other is city structure, particularly in terms of the relationship between homes and work opportunities. If most people live fairly close to an adequate job market, whether in the main center or elsewhere, commuting costs will not be high even if the city is enormous. But where employment in a large city is either highly centralized or so dispersed that job markets tend to be spread over a wide area, or are otherwise unrelated to places of residence, transportation problems and costs are likely to be maximized.

The urban pattern affects transportation needs, but it is equally true that transportation systems have a direct effect on the whole development pattern, and on land costs and density in particular. Roads and transit lines open up new areas for development, and thereby reduce the pressure on sites in older districts. In most developing countries, including India, land prices tend to be much higher in relation to other economic indices than they are in the United States. This difference is due to the high degree of mobility in the latter, which continually expands the area of potential development and thus helps to curb monopolistic price tendencies in land.

In the cases where a large and highly integrated metropolitan community is inevitable or essential in a country like India, a big investment in transportation might conceivably lower land and housing costs to such a degree that it would be an economy rather than an extravagance.

The Timing of Urban Overhead Requirements: Locational Factors

The number of people dependent on industrial or other urban types of employment will inevitably increase. Where they live, and where the new jobs are located will affect not only the scale of urban overhead expenditures, but also when they must be made. In some patterns, the immediate requirements for public and private investment are maximized, while in others some of these costs may be postponed.

In an entirely new town built by government or industry, all the housing and essential community facilities must be provided at the start. To accommodate an equal volume of growth in an existing city, the same number of additional dwellings may be required immediately if there is a severe shortage, but community facilities of some kind are already there and can be supplemented gradually. Of

course, cheap land in the new town may outweigh this advantage in many cases, but it should nevertheless be taken into account in balancing costs and benefits for different locations and patterns.

There is also a third type of situation, where people work in cities or outlying industry while remaining in their villages. Sooner or later, such communities are likely to become "urbanized," with attendant overhead costs, but this will happen gradually, with modest improvements along the way and with a minimum of capital expenditure required at the outset.

The Need for Knowledge

Little enough is known about the social and civic aspects of the urban environment. With respect to the other side of the picture—the effect of the development pattern on economic enterprise, productive efficiency, and employment—there is even less understanding and far greater confusion.

The pattern of urbanization is ultimately determined by the location of economic development and employment opportunity, and it would be useless to reduce overhead costs at the price of economic efficiency. The most sophisticated knowledge and policy with respect to housing and civic problems will be ineffective unless they are closely integrated with sound planning for industrial location and the pattern of economic development.

It has often been assumed that emphasis on the stimulation and gradual modernization of small industry would tend to favor decentralization, with lower overhead costs, while all-out industrialization, with big modern plants, would go hand in hand with great metropolitan concentrations. There is mounting evidence, however, to support diametrically opposite deductions. It is the small semi-modern industry that may often require the nursery of the crowded big-city bazaar area, or the nearest equivalent that can be provided in an industrial estate. On the other hand, large-scale heavy industries are inherently more self-sufficient. They can often be established successfully in rural isolation, as has frequently happened in India.

Modern industry, however, seldom provides much employment for unskilled villagers. But this raises another question. Many economists now argue that part of the function of large-scale modern factories should be to stimulate smaller transitional enterprises in their environs by a kind of "umbrella" influence. If this is true, then the one-industry, single-purpose enclave needs to be reconsidered. In that case, it will be worthwhile to consider integrating different kinds of industry on a regional basis and then to provide a

township to cater to their combined requirements, instead of establishing an ad hoc township for every industry.

There is another potential fallacy in the fatalistic attitude toward private enterprise location. It is often assumed, implicitly or explicitly, that the trend toward industrial and population concentration in a few major areas cannot be diverted, whatever the resulting social costs, because any different pattern would require such arbitrary controls that enterprise would be dampened and productivity reduced. This view tends to ignore the effect of public decisions on locational attractions. Industry and business require many services and facilities—from utilities to good schools—which are largely provided by government. If these expenditures are mainly concentrated in a few big cities—as they probably are today—then increasing economic concentration is a likely corollary. If the magnets are located elsewhere, with due respect for other business requirements, another kind of pattern can be shaped.

Finally, there is the fact, increasingly recognized, that urban overhead costs are a critical element in economic progress, particularly in the present stage of Indian development. The resources required for minimal urban improvements will mount very rapidly, in any case. Any substantial economies that might be feasible would mean a significant increase in the resources available for more immediately productive investment in industry and agriculture.

[Excerpted from "Urban Living Conditions, Overhead Costs, and the Development Pattern," India's Urban Future, Roy Turner (ed), Berkeley and Los Angeles, University of California Press, US$ 7.00, 1961, pp. 276-289.]

DJOLIBA, MALI:
A COUNTERMAGNET TO THE CAPITAL

Thomas Callaway

[Most observers agree that strengthening smaller centers might draw off some pressure from the already overcrowded capitals of many developing countries. This article describes one government's experiment along these lines.]

Throughout the developing world people are flocking to the great cities with the hope of improving their lot. The city's magnetism is powerful and its promise great. But the waves of migrants often far exceed the realities of opportunity, and the promise of better jobs, better education, more possessions and comforts often remains unfulfilled.

As we begin to understand the reason for the city's drawing power, we find that its magnetism can be reduced or at least deflected. To consider stopping migration would be both unrealistic and undesirable. Many migrants will not be stopped short of force, and much of the vitality and potential of any urban center are in its recent arrivals.

However, the creation of "countermagnets" might reduce the flood to manageable proportions. Carefully chosen villages or small towns, located so as to provide potential economic growth, with access to existing centers plus a population willing to improve its own circumstances can, with the injection of some of those things the city promises

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(but cannot always give), become a new urban center in a most positive and productive fashion. Such a "countermagnet" is to be found in Djoliba, Republic of Mali.

Mali, with 92 percent of its population on the land and limited natural resources, realized at an early stage the danger of concentrated urbanization. In Mali, only Bamako, the capital and chief center with a population of 120,000 persons, has the characteristics of the modern city. Even in Bamako, heavy industry is lacking and light industrial development is rudimentary. A man lucky enough to have a job is soon supporting numerous later arrivals, ranging from his own brothers and mother-in-law to distant cousins and former neighbors from his home village. Overcrowding is the rule, with families occupying single rooms and sharing wells or standpipes and primitive sanitary facilities with others in no better circumstances, but all having in common the belief that the city will somehow provide a better life.

The Malian government, concerned with the need to emphasize the country's agricultural potential and the necessity of stimulating the growth of regional centers, approached the U. S. Agency for International Development for assistance. As a result, a development team was provided and research and site selection for a potential "countermagnet" began in the summer of 1962. After discarding several sites due to lack of water or the presence of particular health hazards, the team, in June of that year, visited the village of Djoliba. This village is 45 kilometers southwest of Bamako on the Guinea Road and is within a kilometer of the Niger River. Djoliba's 1,600 people were extremely enthusiastic about participation in the proposed project, and the village was chosen as a pilot site.

Though steadily losing her men through migration to Bamako, the site was distant enough to prevent its becoming a "dormitory" community for those who stayed behind. Observations on the ground, discussions with the villagers, and air-photo maps prepared by a member of the team indicated that Djoliba lay in the center of a productive agricultural area and was a natural market for a dozen surrounding villages. Djoliba's three-room school and tiny dispensary already served those within walking and cycling distance, while its location near the site of the home of the ancient Keita dynasty added to its prestige as a potential urban center. Djoliba was already having physical problems. More than one-half of the community was housed in a dense core of compounds, leaving little room for the labors of net menders, weavers, and blacksmiths who represented existing industry. Wells and pit privies were being dug too close together for safe, sanitary use. In reaction to the congestion, some villagers had begun to build new compounds at some distance from the "core."

The community's 4,650 hectares of land, mostly in sparse bush, produced the rice, corn, peanuts, tomatoes, cotton, tobacco, and herbs necessary to maintain the village and produce a modest surplus. Livestock in the form of cows, sheep, goats, and chickens formed both visible signs of wealth and an occasional feast of meat to supplement a basic diet of starches. The land, in spite of some flooding from the Niger's annual rise, was sufficient in quantity and quality for all foreseeable needs.

Bicycles and log pirogues provided wheeled and water communications. In addition, several planked boats existed capable of carrying up to two metric tons—an important factor if the villages across the river were to come into the orbit of an urbanizing Djoliba. Djoliba was thus well endowed to become an important economic center, if only an environment could be created which would entice its people to remain and others to come.

Planning for Growth

It was determined at an early stage that the pattern of life of the community be retained as much as possible, while providing a maximum opportunity for change and improvement. Planning for the community and its individual dwellings and amenities all attempted to reflect this aim.

In planning the town itself, it was found that the mosque, a grove of trees containing the traditional market area, the existing school, and the "meeting tree," where guests were welcomed, all fell into a rough line at a right angle to the Bamako-Guinea Road. The team decided to retain all these elements and form a central mall with a vista toward the river. Within this mall was planned an enlarged school and youth center, a medical center, and permanent market. To meet the needs of the first development phase of approximately ten years, in which the community should at least double its original size, five neighborhood units were planned. With access to the central mall, open space was reserved between the neighborhood units, providing play areas and reserves.

None of the through streets pierce the housing area, while ten-meter rights of way allow for the use of motor vehicles. The main artery, to the east of the mall, and serving both market and future public buildings, has a twenty-meter right of way with islands to control traffic. To the west of the school, a sizable area was set aside for soccer and other sports activities. Beyond this area, and screened by parkland reserve, eight light industrial sites were laid out for the first stage of larger manufacturing and service activities. Adjacent to this site and stretching from the Bamako-Guinea Road to the river, a road was planned to facilitate the transport of goods to and from this area by wheeled and water transport.

Four of the neighborhood units now contain the original population of Djoliba, housed through aided self-help. Space is provided for kitchen gardens and cottage industries. Based on traditional family life, each basic dwelling consists of a bedroom block of three rooms, a kitchen with "chula" stove and granary, storage, and shower and privy facilities. A "semi-duplex" courtyard arrangement allows for maximum use of the site and retains the long low silhouette of the traditional compound. Water was provided by improved dug wells at the intersection of each four lots—soon to become the favorite gossip center for area wives. The fifth neighborhood unit was laid out in "double parcels" for the more affluent citizens able to build their own houses without assistance. Three additional blocks were left unsubdivided to meet projected needs of unknown economic level during the first phase of development.

At the earliest stage of development it was evident that the new housing facilities in Djoliba, though in some measure austere, were superior to anything migrant families could hope to acquire in Bamako in the foreseeable future. In addition, all families would own their dwellings and land.

Health and Education

The provision of improved health and educational facilities was an important step. The needs for the former centered mainly in the area of childbirth and care. As a result, planning and construction of a two-ward maternity center took place during the second year of development. Primary-school facilities were strained to the limit by local children and by a number of others from surrounding villages—many of whom lived with local families in order to be near the existing facilities. With the arrival of more children, sent by parents who had seen or heard of the development in Djoliba, the construction of additional school rooms was the next project carried out by the community.

An important aspect of the educational program involved the provision of technical skills for Djoliba's development and the creation of a cadre to make possible similar development in other areas. The expansion of skills began with the first aided self-help operations in which 400 people (working 100 per day in rotation to allow farming operations to continue) learned masonry, carpentry, and other skills related to construction.

Three years after the team's first visit to Djoliba, construction began on a small-industries training center, using students from the community and several other centers including Bamako. Two classrooms, tool store, office, and workshops formed the instruction complex. Housing for teachers, officials, and guests, and a central

unit with kitchen, dining, and bath facilities were also built at the center. The center served 58 students in the summer of 1966, providing instruction in carpentry, blacksmithing, mechanics, and electricity (the community's first electricity is provided by two generators located in the teaching complex). Djoliba is now well established as a regional educational center, assuring itself and this area of the new skills needed in the urbanizing process.

Agriculture and Industry

During the first planning stage, investigations were made into the potential for agricultural production and the establishment of related industries. The team consulted with local farmers, experts from the experimental farm near Bamako, and US AID specialists brought from as far way as the Sudan. A master agricultural plan was then evolved, including a parallel industry program.

One example of a new crop was the introduction of the congo bean, whose sturdy stems provided hedges between the houses and protected gardens from wandering sheep and goats. The bean is a high-protein food for humans, while the leaves, shaken loose and sun dried, are considered a delicacy by chickens. An old crop which has fared well is the tomato, which has grown from a subsistence item to 300 tons per year to be shipped to Bamako, where its processing replaces imported tomato paste.

Chicken-raising was increased and formed the basis of a new industry involving meat and egg production. Eggs formed a new item for export to Bamako—a small, easily transported item of high nutritional and monetary value.

The Malians use considerable oil in food preparation. In the Djoliba area various oil-bearing nuts are found in a wild state. These, with peanuts, which are exported in bulk from the area, gave promise of a new industry. Local farmers, guided by one of the team's advisors, with local savings and simple mills provided by US AID, used great ingenuity in establishing oil pressing as a new basic industry. Thus, a start was made in providing alternative employment for farm laborers who would otherwise migrate to Bamako.

Two simple flour mills to process local millet and corn were also established. Easily stored and transported, the product is used locally and the surplus sold in Bamako and in the villages forming Djoliba's natural "market area." By combining waste products from oil-crushing operations with by-products of the milling process, another secondary operation was created in the

production of concentrated cattle and chicken feed. This not only enhances the value of local stock for meat-export purposes but will, through future "lot feeding" of cattle, free grazing land for other agricultural purposes. As cattle increase, so does the potential for a planned leather industry.

Transportation and communication improvements during the first phase included the installation of a crude ferry service to the south bank of the Niger, making possible the shipment of goods to areas otherwise poorly served by a circuitous land route from Bamako, and providing additional raw materials to meet increasing needs of Djoliba's industries and commerce. This outboard-powered boat also provides convenient transport to Bamako for both goods and passengers.

With the increase in products to sell, more local and traveling vendors have taken an interest in Djoliba's market. As a result, permanent market stalls replace the old system of spreading products for sale on the ground. The natural expansion of this area will someday provide a balanced commercial area for the community.

Within 25 years, Djoliba's population should grow to at least 10,000 and possibly more. It will thus become one of the ten largest communities in Mali. Already its educational, health, and industrial facilities and the quality of its housing and general environment are superior to communities several times its size.

[Reprint from "A Countermagnet to the Capital: The Case of Djoliba," International Development Review, Society for International Development, Washington (D.C.), Volume III, Number 3, September 1966, US$ 2.50, pp. 18-21.]

PLANTATIONS AND AGRICULTURAL DEVELOPMENT

In many low-income countries, large plantations constitute enclaves of high productivity and provide valuable foreign exchange through exports. Their effect on traditional agriculture and on attempts to modernize it can be a crucial element in development. Of particular interest are indications that plantations have important "spread effects" and that certain crops, once thought to be suited only for plantations, can be effectively grown by smallholders associated with a "nuclear" plantation.

Below, O.A. SABRY describes a scheme for smallholder tea growing near plantations in Tanzania. Scarlett EPSTEIN shows that work on plantations was the key factor leading to progressive farming and the introduction of cash crops among the Tolai of New Guinea. D.H. PENNY and M. ZULKIFLI analyze the value added by plantations and by adjacent farmers in northern Sumatra. They find that these farmers can achieve efficiency approaching that of the plantations.

SMALLHOLDER TEA PRODUCTION IN TANZANIA

O. A. Sabry

[Tea, once considered suitable only for plantations, is being grown by smallholders in Tanzania. Plantations, the nuclei of the schemes, furnish training and marketing facilities. Government gives credit and support.]

In Tanzania, tea was always produced on large commercial estates in the belief that this would ensure optimum tea-leaf supply to the processing factory. It was generally assumed that growing tea on smallholdings by independent farmers would not offer enough production guarantees, either in quality or quantity, to justify investment in this field.

However, many farmers holding land in the vicinity of tea estates had begun to develop interest in growing the crop, especially as they had gained enough experience in tea cultivation through being employed as labourers on big tea estates. They asked the Ministry of Agriculture for help.

The Ministry's investigations culminated in the Bridger report of 1961, "Peasant Tea Production in Tanganyika." Subsequently, a plan was prepared by the Ministry which covered development of smallholder schemes in four areas. A fifth was added later at the insistence of farmers from the locality. The proposed schedule envisaged that, by 1969, about 3,000 acres of tea would be planted.

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The Smallholder Scheme

To ensure success and proper establishment, it was decided that smallholder plantations should be developed along or near existing commercial estates, on condition that these estates were willing to assist such schemes. The smallholders should be engaged only in the care of tea planted on their holdings; they should not be concerned, in the initial stage, with production of planting stumps or with processing of the leaves. This was to come later, as the farmers became mature and successful. At the initial stages, the supply of stumps, technical assistance in the field, and the processing of tea should be procured through agreements with the nearby estates or through the Ministry. Payment for commodities and other supplies offered to the farmers should be effected through loans made available to the project according to special terms and conditions and in conformity with the plan for development. Each participating farmer would be entitled to assistance for the development of one acre of tea, to be planted in stages over a period of three to four years. This assistance would be extended in kind and under close supervision, mainly to cover the requirements of the crop during the first five years.

Finance

On commercial estates, bringing one acre of tea under production requires a capital outlay of several hundred pounds [1£ =US$ 2.80], mostly to cover field labour costs. On the other hand, smallholder developments require only a very modest capital, since labour is provided free by the farmer's family. It was therefore decided that, based on the average requirements of one man/day of labour per acre in the early stages of tea growth, a family would have ample time to tend its one acre of tea and to grow its food and subsistence crops as well. This would keep the farmer self-sufficient in the initial period until the tea matured.

Loans to the farmer would only cover tea production and would be extended on annual installments, through his cooperative society or directly from the appointed loan agency. These loans would cover supply, in kind, of tree stumps and fertilizers. The repayment of the loan, plus 7 percent interest, would be made through deductions from the farmer's tea proceeds.

The ratio of made tea to green leaf was considered to be 1:4.5. A small grower was expected to receive a minimum price of 40 cents per pound of green leaf delivered to the manufacturer. Loan repayments were fixed at 15 cents per pound [1 East African shilling= US$ 0.14; 100 cents=1 shilling]. Below is a typical programme for establishing and repaying loans on one acre of tea:

Year	Stumps		Fertilizers		Total Loan	Production		Repayment	Net Income
	number (units)	costs @ 35 cts. ea. (shillings)	amount (lbs.)	cost (Shs.)	(Shs.)	(lbs.)	value @ 40 cts/lb. (Shs.)	(Shs.)	(Shs.)
1	875	310	25	10	320	-	-	-	-
2	965	340	75	30	370	-	-	-	-
3	965	340	135	50	390	-	-	-	-
4	965	340	230	80	420	225	90	34	56
5	80	20	307	110	130	675	270	101	169
6	-	-	395	138	-	1, 350	540	205	197
7	-	-	470	164/50	-	2, 250	900	337	398/50
8	-	-	525	168/50	-	2, 950	1, 170	440	562/50
9	-	-	550	192/50	-	3, 375	1, 350	507	660/50
10	-	-	550	192/50	-	3, 600	1, 440	540	707/50
11	-	-	550	192/50	-	3, 600	1, 440	540	707/50
12	-	-	550	192/50	-	3, 600	1, 440	-	1, 247/50

Total: 1, 630

Repayment + 7% interest: 2, 664

From this table it can be seen that a farmer should be able to repay the loan plus interest in 12 years.

Supervision

Most of the growers who joined the scheme have been encouraged to become members of cooperatives. Therefore, their activities are supervised and subject to the conditions and rules of the ordinance which regulates the activities of cooperative societies in Tanzania. Additional supervision covering the technical aspects of tea production is undertaken through the technical departments of the Ministry of Agriculture. The Ministry is responsible for the approval and provision of the loan to each farmer according to his progress in the scheme. Supervision is conducted through field officers and field assistants, whose duties are as follows:

1) To inspect and approve all land intended for tea development by smallholders. This land should be within easy reach of the processing factory or the proposed collecting points on motorable road to a maximum distance of five miles from the factory.

2) Advise the farmers on land preparation including the clearing of land, depth of cultivation, planting distance, etc.

3) Supervise the planting and ensure that good planting material is issued and used by the farmer.

4) Advise on soil conservation measures, mulching, planting bunds with grass weeding, fertilizing, pruning, plucking, and other practices essential to proper tea production.

Nurseries. The provision of suitable planting material to the small growers was a major concern of the scheme planners. At first, the government undertook to establish suitable nurseries on scheme areas. Difficulties arose with regard to the availability of land and experienced staff. It was found more advantageous to rely as much as possible on the commercial estates which were willing to contract for the supply of the needed stock.

Organization and management of the smallholders. In the areas which were marked for smallholder tea production, the prospective farmers were requested to group themselves into a cooperative or a farmers' association. The association applies to the tea-licensing board for a block license to plant tea on behalf of its members. The tea officer surveys the proposed site and checks on the soil slope

and suitability of the area. Once the site has been approved and the loan secured, each farmer clears and tills his plot and stakes the field for planting and construction of anti-erosion measures. The issue and planting of tea stumps are supervised by the field staff attached to the scheme; fertilizers are provided and applied under close supervision; pruning and plucking are demonstrated by the tea officer, while the farmer's work is checked by the field staff.

It should be noted here that the wide range in climate and soil conditions under which tea is grown in Tanzania calls for considerable variation in the details of husbandry; the cost and rate of production also vary from one scheme to another. The average overall yields for the smallholder schemes were estimated to be as follows:

Year	Made Tea per Acre (lbs.)
0	0
1	0
2	0
3	200
4	400
5	600
6	800

These estimates conformed to information compiled by the Tanganyika Tea Growers Association covering the average yield of tea estates. The correct use of fertilizers and the proper technical supervision on smallholder tea schemes is expected to give average yields of 800 to 1,000 pounds, better than those obtained from some commercial estates.

Land tenure. Most of the land earmarked for smallholder tea development is held according to tribal and customary rules. In some cases, where rights over a number of plots are disputed, it has been thought wise to ask the farmers to produce a statement specifying their rights over these lands before they are included in the project. The village development committee, which is responsible to the government for customary land tenure, provides such statements to the eligible farmers.

Marketing. Marketing is arranged through contracts concluded with a tea factory within a proper distance from the schemes. Details of such arrangements vary from one scheme to another, but generally the supply of green leaf to the factory is arranged through the cooperative or the farmers' association. The normal procedure is for the farmer to deliver the green leaf to collecting points which are prescribed in the agreement with the factory. The societies bulk their leaf and, at the same time, the amount delivered by each

farmer is recorded. All rejected leaf is handed back to each farmer at the collecting point. The accepted bulk is taken to the factory where it is weighed and the total amount credited to the society. The members receive payment for their leaf from the society after their loan repayment has been deducted.

Staff and training. Each scheme is supervised by an agriculture officer experienced in tea production. He is further assisted by trained local staffs. Each field assistant is responsible for about 100 growers. The commercial estates have also agreed to allow field staff employed on the schemes to join their own field staff to get acquainted with the practices of plucking and pruning.

The Tea Research Institute of East Africa holds planters' courses annually. These courses have a scientific approach, and officers from the Ministry of Agriculture have attended two of them.

The training for farmers is conducted in the field—on their plots or on nearby estates. Demonstrations and extension work are made available through the technical staff of the Ministry.

Implementation

The first plantings were conducted in 1961, but due to many difficulties normally experienced when a new scheme is started, the area planted in this first year was insignificant. By 1962, the programme was underway and properly organized, especially when enough finance to cover development costs was secured from internal and external sources, namely US AID. Later, in the course of further implementation, changes had to be introduced into the planting schedule. By the end of June 1965, of 23,308.80 acres planted with tea in Tanzania, 1,678.33 acres, or about 7 percent of the total, belonged to smallholders. More significant is the rate of growth: out of 1,341.93 acres of tea planted in Tanzania during 1964/65, smallholders contributed 52 percent of the total increase, or 717.66 acres. Although smallholders' plantings are recent and have not yet reached the production stage, 329,145 pounds of green leaf were produced and marketed in 1964/65, which is ten times the previous year's production.

The progress of smallholders' plantings can be summarized as follows:

Acres Planted with Tea by Smallholders from Year 1961 to 1965

1961	1962	1963	1964	1965	To-Date
2.54	172.95	226.30	558.90	717.66	1,678.35

It is hoped that 840 acres of tea will be planted during 1965/66.

Since the beginning of the scheme, the proposed area for tea planting by smallholders has been raised so that acreage would fit into the maximum processing capacity, as well as to the availability of funds. Therefore, it is hoped that, by 1970, smallholder acreage will increase from the present 7 percent to 17 percent of the total area under tea in Tanzania.

It should be noted that an additional scheme, in Balangai, was started by smallholders who associated independently, applied for and received a tea-planting license, secured a loan internally, and arranged for processing their tea through a nearby estate. In Amani, another tea settlement scheme was started by the government, mainly with the object of attracting squatters who had illegally settled around this area.

The criteria for forming priorities among the farmers eligible to join any scheme have been based mainly on technical considerations, distance of the plot, soil, size of family, etc. In some events, eligible applicants have still exceeded the places available. In such cases, the local administration or the cooperative society is asked to make the final cuts.

The number of farmers who joined smallholder schemes up to the end of June 1965 was 2, 185. Of these, 7 had sold their rights to other farmers and another 40 failed to continue their yearly programme or abandoned their fields completely. About 94 percent of the remaining farmers are doing above average, 4 percent are listed below average, and 2 percent are unlikely to continue in the schemes.

There is information that, on some of the schemes, farmers have tended to overplant—i. e., to increase the acreage of tea planted annually without the consent of the agricultural officer in charge. This tendency has only been reported recently, and reactions to this matter by the authority responsible for the tea schemes have not yet been made clear.

In the original plan, provisions were made so that all smallholder tea schemes should be started adjacent to well-established commercial estates that were willing to provide assistance and support. In one case, at Bukoba, these plans did not materialize. When the area was earmarked and planned for tea development, a possibility existed for the establishment of a commercial tea estate there. When delays occurred in establishing this estate, the Bukoba smallholder scheme was put in a difficult situation. Demonstrations on the agricultural experiment station near the scheme were not enough to convince smallholders in Bukoba of the merits in tea production.

Therefore, a trip was arranged for selected presentatives of the farmers to visit other tea areas in Kenya. When they returned, they did a good job of convincing their fellow farmers to plant tea and join the scheme. However, the Ministry of Agriculture had to establish and run a nursery, and to concentrate more on technical assistance in this area.

Marketing and processing of tea was another concern to the Bukoba scheme, but possibilities of selling the harvest to an instant tea factory in Uganda kept the project alive until the National Development Corporation, a para-governmental commercial organization, got interested in the scheme and provided capital for the construction of a processing plant and for the development of a tea estate.

In the view of the author, these developments are mainly responsible for the relatively high number of failures among the farmers in Bukoba who, at one stage or another, had the impression that their efforts were in vain, especially while they could not foresee possibilities for marketing their crop. Twenty-six of the 47 failures were at Bukoba.

Discussions and Appraisal

It is obvious that smallholder tea schemes in Tanzania have been growing in the right direction. The yearly increase in acreage and in the number of farmers joining the schemes, the small percentage of failures, and even the illegal practice of planting more acreage than authorized demonstrate clearly that these schemes have definite appeals to the farmers. One more convincing fact is the rate of progress achieved simultaneously on schemes hundreds of miles apart. All this suggests that these developments should be carefully considered. They provide valuable experience and guidelines to workers in the field of reform and agricultural transformation, especially since tea was generally regarded as an estate crop that could not be produced satisfactorily by smallholders.

The trend of success in these schemes has not been accidental. The reasons behind these achievements can be summed up as follows:

1) The schemes originated through strong requests from able farmers who were willing to plant tea, a profitable cash crop, for the purpose of raising their present standard of living.

2) Planning and implementation were not started until the problems involved had been carefully assessed.

3) Plans for development recognized the need for flexibility and revision during implementation. Officers in the field

or in headquarters were given a certain freedom of action and were not always requested to follow a rigid plan. One example is the decision to switch nursery production from government control to private estates when difficulties occurred in implementation. Other examples are the measures initiated to carry on development of the Bukoba scheme.

4) Farmers were not left entirely dependent on tea for income. This resulted in reductions in the amount of loans extended to each farmer. They did not need loans to guarantee subsistence until sufficient income was available from their tea. Instead, the planned restriction in tea acreage per farmer gave them enough time to cultivate other crops and diversify their production, and also resulted in the introduction of more farmers to the schemes.

5) Assistance and loans were carefully supervised and handled through one agency and were offered to farmers in kind so as to insure their proper use.

While the tea schemes are reported under constant development and progressing towards their ultimate success, it is also pertinent to mention here some problems which have been identified and are under consideration by officials responsible for the schemes:

1) Relations between the schemes and the general cooperative movement have not developed to expectation. In some schemes, the farmers would not join local cooperatives whose activities are not directly related to the tea schemes. Cooperatives in Tanzania are mainly concerned with the marketing of crops. The farmers therefore rightly feel that these cooperatives are alien to their activities.

   Alternately, the farmers were encouraged to form associations, and later were assisted in transforming these associations into specialized cooperatives. It will be difficult to get the tea growers' cooperatives to integrate into the existing marketing unions and federations, especially since the nature of their activities, demands, supplies, and technical supervision do not fit together.

2) Presently, land is held under customary rules, and regarded as secure by the farmers. Later, as the value of their holdings increases, they may require a more stable right to their plots, possibly a statutory right of occupancy. This should also help in the administration of the loans, and would create more incentives for improvement.

3) Plans should include the gradual increase in the smallholders' activities, such as undertaking of nursery production, transport, and, ultimately, processing; especially if they will be able to undertake substantial savings in the cost of production as a result.

4) Closer supervision and drastic measures should be applied to farmers who are not conforming to the technical instructions, especially in the case of illegal tea plantings. The administration might tend to be lenient in such cases, but, since the processing capacity is restricted, illegal planting would exclude others and, therefore, limit the number of benefiting farmers.

5) The social aspect was not given attention in the plans. All of the schemes are situated in a highly developed area. Even so, many social problems may result from the development of the schemes, and provision should be made for such contingencies.

[Excerpted from a paper made available to participants at the World Land Reform Conference sponsored by the United Nations and the Food and Agriculture Organization, Rome, 20 June - 2 July 1966. Document No. RU:WLR/66/G.]

SPREAD EFFECTS OF PLANTATIONS IN NEW BRITAIN

Scarlett Epstein

[The Tolai are the most advanced people in New Guinea in adoption of cash crops. The author shows that work on plantations provided the stimulus for these innovations, and that the "demonstration effect" has affected production more than consumption.]

This paper focuses on how economic growth began in a Tolai community on the island of New Britain in the Australian Trust Territory of New Guinea. It studies different reactions to new economic opportunities, patterns of investment, and how traditional social structure adjusted to new conditions.

The Tolai language group, generally regarded as the economically most advanced of the Territory, numbers about 40,000. It can be divided into those living near the city of Rabaul and in areas of large foreign plantations, and those further from the city, whose land has not been taken for plantations. The former are more "Westernized" and suffer from a shortage of land; the latter have kept their traditional society to a greater extent and have ample, fertile land. This study concerns the parish (town) of Rapitok in the more traditional, inland Tolai region.

Economic History

From the coast, access to Rapitok was difficult before a road was built in 1910. The Germans,

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who ruled the area from 1884 to 1914, did not collect taxes there. There was constant warfare, and the village was on a defensible ridge. No cash crops were grown.

The road led to more contact with the coast, cessation of local warfare, and relocation of the village to the road. Men from Rapitok began to work on coastal plantations and to obtain employment in the modern sector as drivers or in the services. Prior to World War II, they were more interested in working on plantations than in growing cash crops. Of the living men who were of working age during that period, 50 percent had engaged in regular wage employment.

Since World War II, copra and cocoa prices have been high. This has reduced absenteeism as Rapitok men began to produce crops for sale. Only 28 percent of those of labor-force age have worked for wages at some time since 1945, and the present absentee rate is 4 percent. Rapitok's chief economic interest is now centered on its own land, 35 percent of which is still fertile "bush" and available for cropping.

Rapitok Agriculture

Of Rapitok's 2,240 acres, 765 are devoted to crops, 500 are "bush" fallow in the rotation, 800 are fertile virgin "bush," and the rest is devoted to habitations or not suited to cultivation. Of the cultivated land, 600 acres are occupied by tree crops (cocoa and copra) and 165 by food crops. New land destined for tree cropping is interplanted with food crops for two years, while the trees mature. At any one time, 100 acres of land are both planted to young trees and yielding food. Due to the two-year cycle, 50 acres are cleared and planted in this fashion annually and tree cropping is being extended at this rate. Of the 165 acres devoted to food crops, 100 suffice to feed the community, and 65 provide food which is sold for cash or shell money to missionaries, plantations, and others.

Studies show that it requires 100 labor-days to clear one acre of "bush" for tree crops, 40 to plant the trees, and 120 to clear and plant for food crops. Clearing and planting for 50 acres of tree crops each year thus consume 7,000 labor-days or about 25 percent of the available labor (136 men in labor force; 200 labor-days per man-year). Clearing and planting for food crops to be sold require 3,900 labor-days, while the same work for subsistence food requires 6,000. Thus, Rapitok men invest 40 percent of their manpower in agriculture for market and exert 22 percent for food-consumption needs. Labor devoted to establishing cocoa trees, which start bearing four years after planting, and coconut trees, which bear seven years later, must be considered a long-term investment.

The main criterion for deciding which crop to plant on cleared land seemed to be cash yield per acre, although farmers did not actually calculate alternative yields. Cash yields per acre for taro, coconuts, and cocoa were comparable; 30£, 38£, and 41£ respectively. [Aus.£=US$ 2.24] Current labor requirements, such as weeding and harvesting for different crops, played no role in decision making since these tasks are performed by women.

Effect of Association with Plantation Economy

In an effort to determine the factors responsible for economic change, the study divided householders into those who had worked outside Rapitok in the wage economy, usually on Australian plantations, and those who had never done so. In accordance with the results of the study, the former will be called "progressive" and the latter "conservative." A further distinction is made between lineage heads, "middle-farmers," and single men.

Tree crops were introduced in Rapitok by "progressive" lineage heads who had worked on plantations. At first, they had to overcome considerable resistance from conservative lineage heads (i.e., those who had not experienced wage employment) to planting of the new crops on land of their matrilineage. As soon as cash sales were made, the "progressive" elders used the proceeds to feast the "conservative" elders, who had been won over in the meantime.

Agricultural investment. In coconuts, cocoa, and food crops, "progressive" householders farmed larger areas than their "conservative" counterparts. [No evidence is presented of different technology or yields for the two groups.]

Table I. Rapitok Agriculture

Average per household	"Conservative" Households			"Progressive" Households	
	Lineage heads	Middle-farmer	Single men	Lineage heads	Middle-farmer
Area under food crops (acres)	1.10	1.02	1.40	1.52	1.37
Area under tree crops (acres)	6.62	3.92	0.98	8.73	4.67
Nos. of coconut trees	260	123	62	476	192
Nos. of cocoa trees	527	398	--	1,261	563

Capital accumulation. No data on rate of capital formation were established, but Table II shows capital accumulation for the different types of household.

Table II. Rapitok Average Capital Assets

Item	"Conservative Households"						"Progressive" Households			
	Lineage head		Middle-farmer		Single man		Lineage head		Middle-farmer	
	£A.	%	£A.	%	£A.	%	£A.	%	£A.	%
Tools	5.33	2	6.97	6	1.88	44	108.73	4	10.82	7
Cars and accessories	107.35	35	1.88	2	--	--	929.27	32	15.72	11
Bicycles	--	--	11.62	9	--	--	6.00	--	14.85	11
Livestock	4.50	1	19.48	16	0.75	.16	40.00	1	22.24	14
Copra driers	5.00	2	1.25	1	--	--	200.00	7	1.44	--
Shops	12.50	4	4.62	3	--	--	91.00	3	5.26	3
Savings:										
Cash	58.50	18	29.33	25	0.50	11	1,215.50	44	33.52	22
Shell money	133.00	40	40.66	38	1.25	29	250.00	9	46.50	32
TOTAL	326.18	100	115.81	100	4.38	100	2,840.50	100	150.35	100

"Progressive" households had acquired more capital assets than their "conservative" counterparts. In particular, "progressive" clan heads had become quite wealthy, no such housholds having assets under A.£1,000. Tradition demanded that a lineage head or a middle-farmer hold a certain amount of shell money. While "progressive" households held more shell money than their counterparts, their larger total assets enabled them to hold more cash, most of which was kept in savings accounts in Rabaul banks, which sent out representatives to tap this market. "Conservatives" were obliged to hold a large part of their savings in shell money in order to meet the minimum social obligation. Only half of their cash was channeled to banks.

"Conservative" households were able to invest less in productive assets (copra driers, tools, vehicles, shops) than "progressive" ones. Copra economics suggests that investment in copra driers was primarily a matter of prestige, but larger investment in productive resources unquestionably permitted "progressives" to engage in more activities (e.g., timber operations) on a bigger scale.

At the outset of capital formation, most assets were acquired jointly by all or most members of a matrilineage. This arrangement can save capital since an individually owned jeep, for instance, would probably be underutilized, and since few families could afford individual ownership of larger capital items. In practice, the system works only until the asset needs repairs, at which point none of the owners will spend money to restore it. There is a trend away from corporate and towards individual ownership to avoid the resultant waste.

This will have to continue until the Tolai devise a system of joint-stock companies or cooperative entreprises.

Consumption and social differentiation. While previous contact with the modern economy, particularly with the large private plantations, was associated with much more ambitious and successful economic activity and the accumulation of wealth at all levels of society, it did not revolutionize patterns of prestige and consumption in Rapitok. Because of their traditional social position, "conservative" lineage heads managed not only to keep their position of respect but also to control more resources than "progressive" middle farmers.

Consumption patterns changed little. While "progressive" households spent somewhat more on non-productive goods than their counterparts, these expenditures constituted a far smaller portion of their total assets.

Table III. Rapitok Average Nonproductive Property

Item	"Conservative" Households						"Progressive" Households			
	Lineage head		Middle-farmer		Single man		Lineage head		Middle-farmer	
	£A.	%	£A.	%	£A.	%	£A.	%	£A.	%
Clothes	14.02	23	11.32	35	1.80	34	35.83	31	13.08	23
Luxury goods	28.03	46	2.13	7	0.13	2	20.11	18	17.03	30
Household chattels	19.52	31	17.85	58	3.35	64	58.21	51	27.27	47
TOTAL	61.57	100	31.30	100	5.28	100	114.15	100	57.38	100

"Progressive" households were distinguished by more kitchen utensils and somewhat better clothing. However, absolute expenditures on luxury goods by "conservative" lineage heads were greater than by "progressive" ones. Although a desire on the part of "progressive" heads of lineage to build expensive "European-style" houses seems imminent, most "progressive" and "conservative" families are remarkably similar in consumption patterns and are not interested in acquiring nonproductive property. This fact would seem to indicate that the Tolai attach prestige to the accumulation of wealth and productive assets and not to consumption.

Conclusions

Contact with the wage economy and work on large plantations initiated economic development among the inland Tolai. Historically, former plantation workers were responsible for the introduction of

new farming techniques, particularly of coconut and cocoa culture. The new techniques were then adopted by others who had not had contact with the plantations, but such farmers were not as ambitious in producing cash crops nor did they accumulate as much wealth.

The Tolai show a high propensity to save but a low propensity to consume. Nurkse said of underdeveloped areas, "the small rate of saving is due not only to the low absolute level of real income but also to the high propensity to consume, caused by the allurement of superior forms of consumption." Tolai economic growth shows that this international demonstration effect may be much stronger for productive activities than for consumption patterns.

So far, the impetus to economic change in Rapitok has come from outside. Due to the great success of cash-crop farming, few of the men now work outside of their town. There is a danger that the source of innovation will thus be cut off, and that the people will become inward-looking, instead of making economic innovation part of their system. To guard against this threat, emphasis should be placed on higher education in management and on provision of an economic advisory service to encourage the most productive forms of savings and investment.

[Summarized from "Economic Change and Differentiation in New Britain," The Economic Record, The Economic Society of Australia and New Zealand, Melbourne, Volume XLI, Number 94, June 1965, US$ 1.75, pp. 173-192.]

ESTATES AND SMALLHOLDINGS: AN ECONOMIC COMPARISON

D. H. Penny
M. Zulkifli

[Value added per labor unit and per land unit is higher for plantations in North Sumatra than for small farmers, but not much higher. The plantations seem to have had a spread effect on surrounding areas.]

Many countries are faced with the problem of choosing the best form of agricultural-production organization for economic development. Where there is more than one type, e. g., estates and smallholdings, consideration is often given to choosing or at least favoring one over the other(s). It is difficult, however, to make appropriate policy decisions if no suitable basis exists for comparing the economic performance of the different types of production organizations.

This paper provides, with Indonesian data, a direct economic comparison of estates and smallholdings. In this way, the respective advantages (and disadvantages) of estates and smallholdings can be more meaningfully discussed. It is shown that the efficiency differential in favor of the estates is probably less than generally believed. The paper concludes with a brief discussion of some policy implications suggested by the analysis.

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A Basis of Comparison

It is commonly believed in Indonesia that estates are more efficient than smallholdings. Estates develop and adopt improved practices; estates are orderly, e.g., the trees are in rows; estate managers are well educated, have cars, and live in big houses; estates use large-scale, modern methods; and estates have profit maximization as their goal and therefore must make more economic use of resources than peasant farmers producing for subsistence with traditional methods.

If the problem of estates versus smallholdings is looked at in this way, one might almost inevitably draw the conclusion that estates are, and will probably continue to be, more efficient than smallholdings. To rely on such arguments, plausible though they seem, may still provide a distorted picture of the true, relative economic efficiencies of the two types of farm organization; when economic comparisons are made between one type of agricultural enterprise and another, one must be sure that a suitable common basis for making such comparisons has been used.

The fact that proponents of peasant farming often rely largely on noneconomic criteria is further evidence of the need for using a common economic basis for comparison.

In the example that follows, value added, i.e., value of production less value of purchased inputs and excluding direct payments to factors of production, has been related to two major resources employed in each enterprise, land and labor. In this way, the income produced in each enterprise may be compared with the resources employed, and direct comparisons of the economic performance of two quite different types of production organizations might be made. Only two measures of efficiency, value added per hectare and value added per man employed, have been used since it was difficult to get an adequate comparable measure of capital.

An Indonesian Example

Background. The east coast of Sumatra, in Indonesia, is a major plantation area. When the estates were established (the majority from 1900 to 1920), there were few smallholders in the area. A great expansion in the number of smallholdings occurred during and immediately following World War II.

The data on estate operation are for two large, foreign estate companies operating about one-quarter of the area under estate rubber in the east coast region. Rubber is the dominant estate crop.

The data on village agriculture are for a total of 45 farms from three villages each situated close to sea level within 20 miles of the provincial capital, Medan. Two of these villages adjoin rubber estates. All but one of the farmers surveyed was a new settler, i.e., took up land in the area within the last 20 years; three-quarters of the total were ex-plantation laborers. All of them were subsistence farmers, i.e., grew food crops in traditional ways for their own consumption, selling only the surpluses.

No market in Indonesia is exempt from government intervention. This is particularly true of the market for foreign exchange. The rupiah has been overvalued in terms of foreign exchange for many years; export producers have thus received much less (sometimes as little as one-third) than they would have received if foreign exchange had been sold on a free market. Thus, two independent calculations of the efficiency indicators were made, the first in rupiah (local currency) terms, which reflects the actual situation faced by estate and farm managers, and the second, in dollar terms, which shows what might have been earned if sales and purchases could have been made at world market prices. The dollar figure thus provides a measure of "social" value added.

Value added by estates. In 1960-61, the average production of rubber per tappable hectare was 526 kilograms. For the total area used, i.e., tappable rubber, areas under replanting, and roads, housing lines, factories, etc., it was 392 kilograms per hectare. The gross value of production per hectare was Rp 8,820 at an average rupiah price for all grades of Rp 22.50. Since purchased inputs were 15 percent of the value of production, the value added per hectare was Rp 7,500. The average labor force per hectare was 0.45 persons; this included both permanent and casual (borongan) labor, and covers field laborers, factory workers, and office personnel on the estate. Value added per worker was Rp 16,700.

Value added in village agriculture. For the villages, average gross value of production per hectare was Rp 10,100 for the same period. Average farm size was 1.87 hectares. Annual value of purchased inputs was 3 percent of total value of production, thus value added per hectare was Rp 9,800. There was an average of 2.06 adult male equivalents per farm, all but $2\frac{1}{2}$ percent of which was family labor; thus value added per worker was Rp 8,900.

Summarizing:

		Estates		Smallholdings
Value added per hectare	Rp	7,500	Rp	9,800
Value added per man employed		16,700		8,900

The efficiency indicators when calculated in dollar or world market terms are as summarized below.

	Estates	Smallholdings
Value added per hectare	$183	$149
Value added per man employed	407	134

Study Results

Since the generally held view was that estates were much more efficient than smallholdings, it was decided to confine the study to a comparison of estates and subsistence farms only.

It is recognized that the data on which this comparison is based are probably not as complete as one would wish. The importance of the question and the paucity of data on the economics of smallholder agriculture in Indonesia justify making the comparison, however.

The differences in incomes per family are less than the data for value added per man employed would indicate, since smallholdings had more "breadwinners" per family of the same size. The wages of estate laborers are, of course, lower than the figures for value added per man employed would indicate.

It is not surprising to find that subsistence farms have a relative advantage in value added per hectare, i.e., when compared with value added per man employed, since rubber production is labor extensive compared with rice production.

The efficiency indicators show that estates are somewhat more efficient than subsistence smallholdings. The indicators also suggest that the arguments on behalf of the estate are rather overstated.

Implications

The economic scales have traditionally been weighted in favor of the estates. Such advantages have included: 1) the sympathy and understanding of government, particularly during the colonial period; 2) monopsony power and/or preference in the purchase of many commodities, e.g., imported production requisites, and in the purchase of price-controlled consumption goods; 3) the ability to import cheap labor—indeed, if local labor had had to be employed there is some doubt that the plantations would have been viable; and 4) access to research information denied to smallholders.

While it is true that estates have been hampered in their post-independence activity by government policy inimical to foreign enterprise and estates generally, all the advantages listed above are still available to them.

It is interesting to speculate how estates would compare with smallholdings if the latter were operated by men who were somewhat less subsistence oriented, had better access to the market for fertilizer, etc., and were served by research and extension services.

It seems clear from other work done that the interest of small farmers in increasing productivity is much greater than is generally realized. It is probable, however, that if given the chance, estates could increase production more rapidly than smallholdings, since the institutional changes necessary to provide adequate agricultural services for smallholders are much greater than for estates.

Estates are much more effective than smallholdings, as presently operated, as a source of foreign exchange and taxes. Thus they play an important role in the generation of funds for economic development.

However, the fact that smallholdings can produce approximately the same real value per hectare of food crops might be regarded as all important in a country such as Indonesia where there is a food deficit and arable land is scarce.

In conclusion, the use of simple indicators provides a rather different picture of the relative efficiencies of estates and smallholdings than the generally accepted one. The measures used should be such that direct and relevant comparisons might be made.

[Excerpted from Journal of Farm Economics, American Farm Economic Association, Menasha (Wisc.), Volume VL, Number 2, December 1963, US$ 2.00, pp. 1017-1021.]

RESEARCH EXPENDITURES BY DEVELOPING COUNTRIES

Rationalization of production and distribution by application of science and technology is the heart of development. This requires the application of science to the economic problems of the countries in question—in other words, research of local relevance. Some of this work is carried on by rich countries and results can be imported; some must be done locally, using local resources. Therefore, the crucial questions become: To what extent can research results be borrowed from abroad? How much research must be carried on locally, and how much can low-income countries afford to spend (or afford not to spend) on it? What kinds of research get priority? What kind of payout can be expected and when?

M. G. K. MENON makes the case for greater expenditures on research. Mahbub ul HAQ, head of the Perspective Planning Division of the Pakistan Planning Commission, takes the economist's view, trying to find ways to improve allocation of expenditures on research and education. Salimuzzaman SIDDIQUI discusses problems of using the results, and Abdus SALAM proposes a solution to the drain of the most brilliant researchers and scientists from the low-income countries. These papers were presented to the recent Symposium on Science in South Asia, a "scientific Tashkent" sponsored by the Rockefeller University and other organizations in New York.

THE ROLE OF FUNDAMENTAL RESEARCH IN NATIONAL DEVELOPMENT

M. G. K. Menon

[A developed economy depends on modern science and technology. Research must take place in the country itself to develop this. Research transforms intellectual climate and education, and it is profitable.]

Homi Bhabha, in a speech to the General Assembly of the International Council of Scientific Unions on 7 January 1966, remarked,

> "What the developed countries have and the underdeveloped lack is modern science, and an economy based on modern technology. The problem of developing the underdeveloped countries is therefore the problem of establishing modern science in them, and transforming their economy to one based on modern science and technology. An important question which we must consider is whether it is possible to transform the economy of a country to one based on modern technology developed elsewhere, without at the same time establishing modern science in the country as a live and vital force. If the answer to this important question is in the negative, and I believe our experience will show that it is so, then the problem of establishing science as a live and vital force in society is an inseparable part of the problem of transforming an industrially underdeveloped to a developed country."

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What I would like to discuss here is the role of fundamental research in this aspect of development, in establishing modern science as a live and vital force in society. I shall also deal with some aspects of the organization and support needed to enable it to fulfill this role. I must emphasize that my experience is restricted to India; but much of what I have to say will illustrate aspects common to most underdeveloped countries.

Kinds of Research

Budget allocations for science are usually shown under the general heading, "Research and Development"; and research is further shown as "pure" and "applied."

Pure science deals with the discovery of new facts and with the understanding of nature. These studies are not directed towards the solution of immediate, concrete, practical problems. Work in pure science is judged by the international scientific community as a whole.

In the case of applied research, there is a definite practical aim in mind. It is not necessary that the aim should turn out to be feasible or that it should be accomplished; and indeed, if it is accomplished, that it should be economic. Applied research can and should be a highly creative process; ideally the creativity should be of the same order as in pure science.

Development, however, involves the effective, economical, and safe execution of a task which has been shown to be feasible on the basis of applied research and past experience.

A crude breakdown of the research and development budget in the U. S. A. indicates a level of expenditure of about 15 percent on basic research, about 20 percent on applied research, and about 65 percent on development. These levels appear to represent balanced development.

Importance of Fundamental Research

Effect on intellectual climate. Professor Weisskopf, in "Why Pure Science," a recent article in the Bulletin of Atomic Scientists, has eloquently expounded the importance of fundamental research. He remarked,

> "The value of fundamental research does not lie only in the ideas it produces. There is more to it. It affects the whole intellectual life of a nation by determining its way of thinking and the standards by which actions and intellectual production

are judged. If science is highly regarded and if the importance of being concerned with the most up-to-date problems of fundamental research is recognized, then a spiritual climate is created which influences the other activities. An atmosphere of creativity is established which penetrates every cultural frontier.

"Applied sciences and technology are forced to adjust themselves to the highest intellectual standards which are developed in the basic sciences. This influence works in many ways: some fundamental research students go into industry; the techniques which are applied to meet the stringent requirements of fundamental research serve to create new technological methods. The style, the scale, and the level of scientific and technical work are determined in pure research; that is what attracts productive people and what brings productive scientists to those countries where science is at the highest level. Fundamental research ... creates the intellectual climate in which our modern civilization flourishes."

This intrinsic intellectual and cultural value of pure science and its all-pervading character is readily recognized by the expert. It is this which is so difficult to put over to a layman; but is so important to do successfully.

Impact on education. Education, in its broadest sense, involves 1) the acquisition of new knowledge, 2) its preservation in suitable form, and 3) its transmission to future generations. The first part constitutes basic research. Very often, with unfortunate consequences, the mere process of handing over knowledge as a dead, inanimate object is considered to be education, and learning by rote and uniformity are stressed. The only way by which teaching can be prevented from getting into this rut of routine, pedantic transmission of facts is by envisioning, side by side, the accomplishment of significant, fundamental research which leads to a tradition of penetrating, independent inquiry.

Profitability. Investment in pure science is immensely profitable in the long run. All those who have been concerned with this question agree that the returns are indeed spectacular. Whatever way it is looked at, it is clear that money spent on fundamental research is excellent investment, though a long-term one, and not to be regarded as an overhead or a luxury.

Selling Basic Research

The arguments presented above have mostly been advanced in the affluent nations of the world in support of pure science. However,

they apply equally to the developing areas. The problem is not one of their validity. The problem is: how does one get these arguments across to the men who matter—the ministers, parliamentarians, politicians, the civil servants and, in general, the elite who have the say in allocation of resources.

I can well understand their problems. In India today, we have the grim demands of food and agriculture, aggravated by the vagaries of weather, problems of defence, and priorities for industry in its many facets of power, transportation, materials, and production. Faced with these demands and with the background of a democratic system, it would be natural to say, "let us meet the immediate needs first; we can deal with intangible things like fundamental research later."

Those of us who are scientists have an important responsibility, a continuing responsibility to educate this elite to the fact that fundamental research is not cake but the bread of daily life. It is for us to point out that the investment needed is very small, only of the order of 2 percent of the gross national product. There is a gestation period of the order of one to two decades and one cannot and should not expect immediate results. However, science has self-generating characteristics once we get on to the known exponential growth curve. The returns, based on our experience elsewhere in the world, are known to be spectacular. What is needed is an effort on the part of scientists to secure the necessary allocation—an effort which may take different directions and needs to be directed towards the various sections who compose the elite responsible for resources allocation.

[Excerpted from "The Role of Fundamental Research in National Development, Its Organization and Support," a paper presented to the International Symposium on Science in South Asia, sponsored by the Carnegie Endowment for International Peace, the Rockefeller University, the University of the State of New York, and the Association for Asian Studies, New York, 5-7 May 1966. Proceedings of the Symposium will be published by the Rockefeller University Press, New York, in 1967.]

PLANNING INVESTMENT IN SCIENTIFIC RESEARCH

Mahbub ul Haq

[Planners must think of returns on research. Research effort in low-income countries has been meagre, but also much misdirected. Savings could be realized through international specialization. Research, education, and training should be harmonized with national objectives.]

Economists are often described as those creatures who know the price of everything and the value of nothing. By the time I finish my presentation, you may well conclude that that is an appropriate definition.

I propose to talk today about the cost and benefit of scientific research and will raise certain questions about the kind of investment that is currently going into the so-called promotion of science and technology in South Asia. We have heard a lot of lament about the meagre resources being devoted to scientific research in South Asia, but we have heard very little about the concrete benefits that these societies are getting out of their investment in scientific research. A number of speakers have talked about the priority that should rightly be given to science, but very few have tried to indicate how priorities are to be fixed within the field of scientific research in the light of the current and growing requirements of these countries.

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During the last few years that I have been associated with the Pakistan Planning Commission, I have been conditioned to deal daily with questions of costs and benefits, of priorities and misallocations. I am afraid that some of the things I have to say may not be exactly popular, but my intention is to raise issues, not to offend.

There is a curious imbalance today between the demand and supply of scientific personnel in South Asia. On the one hand, we hear loud complaints by the economists that critical skills are missing and economic growth is being retarded. For instance, Pakistan's third five-year plan complains of a shortage of 10,000 engineers and similar shortages of other skills in the scientific field. On the other hand, we have the familiar phenomenon of unemployed scientists roaming the streets. It is not uncommon in India, Pakistan, and Ceylon to find a large number of engineers and doctors who either cannot find employment, take on positions not entirely appropriate to their training, or go outside the country.

These countries also depend quite heavily on imported skills, particularly foreign consultants, usually covered under programs of technical assistance. Pakistan, for example, is spending over $100 million a year on foreign consultants. This exceeds 1 percent of its total national income. Compare this to some of the figures cited this morning; about 0.1 or 0.2 percent of the national income is being devoted to scientific research in various countries of South Asia.

Clearly, something is wrong. I venture to suggest that what is wrong is the content of scientific training and what is inappropriate is the priorities within the education sector. Not enough attention is being devoted to the content of education and scientific research. While I agree that too little is being spent on scientific training and research, the fact remains that a large proportion of even these meagre funds is being wasted.

Overspecialization

There is, firstly, the error of overspecialization. This may sound rather strange, but a little explanation will make the point clear. Generally, there is a shortage of middle-level technical personnel in South Asia. It is the overseer on a road project, the supervisor on a construction job, the paramedical personnel like nurses and health visitors who are generally in short supply, while the system concentrates on producing highly qualified engineers, doctors, and architects who may not be required by the society in the numbers in which they are produced.

There is a certain craze for imparting the latest and the "best" education to students, irrespective of what is demanded by the economic system. Thus, a lot of investment is made in producing highly qualified personnel, with a good deal of time lag involved in their training. As a result, we have the strange spectacle of these poor countries creating skills for the export market.

To quote only one example, about 20 percent of the doctors presently trained in Pakistan seek employment abroad. Only a short time ago, we had a system of producing middle-level doctors in Pakistan, primarily to serve in the rural areas. This was abolished under the mistaken notion that, in this age of modern science and technology, the society needed advanced training in medicine rather than this intermediate level of training. All this occurs in a situation where the present distribution of doctors is so uneven that there is only one doctor available for every 20,000 rural people as against one doctor for 700 people in urban areas, and when the total supply of paramedical personnel like nurses and health visitors is only 23 percent and 7 percent respectively of the total availability of doctors! So, instead of a practical and operational system of village doctors, who could perhaps take care of such widespread diseases as malaria and cholera and who could provide some benefit at least to the majority of the population, we now concentrate on investing in those doctors who get their training for at least five years in the medical colleges, then generally go abroad for further specialization. They come back, after a considerable time, only to discover the obvious fact that they could not go into the countryside, since they would be wasted there without the kind of equipment and facilities that they need for their advanced type of research or specialization.

There is a lot, I think, to be learned in the sphere of specialization from the early twentieth century experience of Russia, where the education curriculum was geared quite closely to the manpower requirements of the society. People were trained for a particular job. The skills were narrowly defined and, with a fairly small investment and within a short period of time, skilled personnel were produced for the kind of jobs society had to offer. The type of scientific training that is given should be closely related to the manpower requirements of growing societies and, as such, should be planned much in advance instead of being left to the haphazard working of the free academic system, as at present.

Inappropriate Research

Secondly, there is the error of inappropriate "applied" research. We have had a lot of controversy in this symposium about the priority of applied research over fundamental research. Much less has been said about the kind of applied research that is relevant for these

countries. It has been argued that about 80 percent of the funds placed at the disposal of various distinguished scientific institutions have actually been devoted to applied research. This may be so, but the question is what kind of applied research it was.

If I may illustrate once again from Pakistan (I am choosing all my examples from Pakistan because I think it is safer to offend my own countrymen!), in the last five years, about 10 times as much money has gone into nuclear research as into other fields of applied research, e.g., to develop an appropriate technology for the production and manufacture of jute, or for the exploitation of the large resources of fisheries that Pakistan possesses. These two natural resources earn upwards of $300 million of foreign exchange for Pakistan, but the funds devoted to research in these fields were only a small fraction of the money that went into the more glamorous field of nuclear research.

When we discussed this question of research priority within the Planning Commission, it was argued vehemently by those in charge that nuclear research was the wave of the future, that we could develop a lot of peaceful uses of nuclear energy, and that we shall be left behind in the race of modern science and technology unless nuclear research is given adequate funds. Unfortunately, the proponents of nuclear research, or other types of advanced and glamorous research, are far more vocal and better trained than the proponents of research into such earthy subjects as suitable varieties of crops, or agricultural technology, or fishery resources, or other such fields which have a direct bearing on the growth prospects of the country.

If we look around this forum, we shall find that all the distinguished scientists invited from India and Pakistan generally represent the advanced fields of research and there is none here from these countries who has a specialization in the less fashionable subjects of agricultural research or fisheries or other such fields so close to the heart of an economist and so oft forgotten by the scientist. The real tragedy is that, whereas much of the nuclear research or the advances in heart surgery can be borrowed from the Western world, it is exactly the kind of applied research on the exploitation of these countries' own natural resources which is not available abroad. In fact, to quote just one example, the West is undertaking industrial research to find synthetic substitutes for jute; it is for the jute-producing countries to devote considerable funds to find new uses for jute and to broaden its market.

Unfortunately, it is not only the national governments which have a distorted pattern of research priorities; the outside world willingly lends a hand. Recently, Pakistan received substantial

assistance from Germany to set up a modern heart clinic. Similarly, the nuclear-research program of Pakistan is expected to be aided to the extent of about $60 million by the outside world. It appears that it is easier to attract funds from the aid-giving agencies for the more glamorous research subjects than for some down-to-earth applied research.

Adapting Foreign Technology

Thirdly, one of the most common fallacies among scientists is that the most modern technology is also the most appropriate one for their countries, irrespective of their own factor endowments. In the West, the shortage of labor and abundance of capital has naturally led to the development of a relatively capital-intensive technology. In India and Pakistan, with their current population problems, it is a labor-intensive technology that is needed and numerous adaptations must be made in the imported technology before it can be regarded as appropriate for the economic conditions of the countries concerned. There is a crying need, therefore, for industrial and technological research to adapt imported technology to domestic factor endowments and prices. The private sector in these countries is not likely to take up this research for quite a long time to come, partly because the benefits of such research extend far beyond any individual enterprise and are in the nature of a social service. It is incumbent, therefore, on the government to sink a lot of investment into applied industrial research.

In fact, this was the main rationale for the setting up of Councils of Scientific and Industrial Research in India and Pakistan. However, if one analyzes the contribution that these agencies have made to the industrialization programs in their countries, one is sorely disappointed. Recently we formulated an industrial program of over two billion dollars for Pakistan's third five-year plan, and I am constrained to say that not more than 1 percent of this program is likely to be based on the technological research developed by our Council of Scientific and Industrial Research. This is no criticism of the Council. It may well be that the planners are not making appropriate allocations for the Council and have not yet recognized that they should not quibble about a few million dollars' being devoted to industrial research when their industrial programs are so ambitious. It may well be that the entire price system is wrong, so that there is no incentive for technological adaptations of imported technology when foreign exchange and capital are being grossly underpriced. What I am emphasizing is the fact that the net contribution of the indigenous industrial research to the growth of the economy has been practically negligible so far.

International Specialization of Research

I would like to support the idea of international specialization in scientific research as advocated by Dr. Salam. [See pp. 80-84] Somehow, we have accepted the idea of international specialization in the field of commodities, but fight shy of it in the field of scientific research. We do not attempt to produce all our requirements of automobiles, air conditioners, or heavy machinery in Pakistan, but concentrate on certain things for which we have a comparative advantage, like cotton cloth, jute manufactures, cement, fertilizer, etc. And yet when we come to the frontiers of knowledge, there is a general reluctance to accept international specialization. We drift aimlessly into fields of nuclear research, heart surgery, and what have you. We try to build the latest laboratories, import the latest equipment, and devote our best talent to these activities, even if we could obtain much of this research from the outside world.

Scientists are fond of making out an argument for self-sufficiency in all fields of modern research, irrespective of their cost and priority, and national governments are quite willing to patronize the so-called advanced fields of scientific endeavor for reasons of national prestige. As a result, we have come to a stage where an underdeveloped country does not consider itself respectable unless it possesses a costly nuclear-research center. Would it not be more worthwhile for these countries to devote their meagre funds to scientific research of immediate, practical use and to send specialists to an international institute of the kind that Dr. Salam was mentioning? The concept of international specialization in scientific research would prevent each country from duplicating facilities in the scientific field and obtaining poorer results at a much higher cost by trying to do everything within the country. My main point is that the costing of scientific training and research ought to be done far more carefully in our poor societies than has been done so far.

National Specialization

Apart from the question of international specialization, there is also the need for better national specialization in scientific research. Currently, there is a strong tendency on the part of national governments to spread institutes of scientific research, with similar departments of science and with fairly inadequate equipment and personnel, all over the country. Yet, their resources may not be sufficient to man even one such institute. The net result is that whatever training and research these poor societies can afford get diluted. There is a considerable waste of financial resources in duplicating facilities in various part of the country rather than concentrating them in specialized institutes.

There is a real opportunity, I should think, of reforming the content of scientific research and training to give it a sharper focus in the light of the country's own requirements and to prevent the huge waste of investment in poor-quality education and research. Let me give you a few illustrations of the colossal waste that is involved in the present system of education and training in Pakistan. If we start from the primary level of education, we find that 82 percent of the children who enter class 1 drop out before reaching class 5. Thus, the society loses a substantial proportion of its investment in primary education. As we proceed further, the drop-out rate declines but the failure rate rises. We find that generally about 30 to 40 percent of the students in colleges and universities fail to get their degree. In the case of Pakistan, this means that two out of the six universities are practically not producing. I am sure that there would be quite a howl in the country if two out of six factories in which the society had invested had stopped production. Yet somehow, the society tolerates the high failure rate at the university level with baffling equanimity and without worrying much about its economic calculus. To pursue the story further, many of the graduates of the universities are not gainfully employed by the economic system so that there is a further waste involved in their training.

It is all very well to complain that education and research are being allocated less than 2 percent of the national income in Pakistan. What is staggering is that the society is getting an extremely poor return even on this 2 percent.

Research, Training Priorities, and Manpower Planning

To return to the area of scientific training and research, I would re-emphasize that there is something fundamentally wrong with the planning and programming of this field. Scientists are not deriving their priorities from the basic and overriding objective of these societies to accelerate their growth rate. Ideally, an estimate should first be made of the kind of skills that the society requires over the long run in order to meet its growth and other objectives. A comprehensive manpower plan should be prepared on this basis. It should indicate the requirement of skills by various broad categories, as well as certain detailed specifications in so far as that is possible. This manpower plan should be tied in with the educational system of the country by relating various job specifications to different educational curricula. The technical training programs should then be formulated in detail within this framework. This should be done sufficiently in advance, since there is a considerable time lag in producing human skills. Similarly, research priorities should be derived from the growth requirements in various sectors like agriculture, transport, industry, etc., and should be aimed at the maximum exploitation of the natural resources of the country. I am quite aware of the

difficulties of such an approach, but even if we can make second- or third-best guesses, these would still be preferable to a haphazard development of scientific training and research, without any heed to the cost and benefit of such research to the society.

I hope that such programming would induce some of the local doctors to do some research on local diseases, rather than for the society to keep waiting for an Albert Schweitzer to come and do it for them, just because the local doctors are too busy working on heart surgery or other such fashionable subjects. This might also prevent these countries from exporting their own doctors and engineers while relying heavily on foreign consultants for their immediate requirements. The "curious imbalance" to which I referred at the beginning is mainly a symptom of the lack of adequate and good planning in the field of scientific training and research.

How the Planner Can Do It

One of the most difficult problems in these countries would be to make the preferences of individuals conform to the objectives of national planning. Since both India and Pakistan have mixed economies, with considerable emphasis on individual initiative and enterprise, the problem cannot be handled by directing individuals to choose various subjects of research and training which society, in its infinite wisdom, has decided to be necessary for its future growth. There are two main ways that this problem can be handled.

Firstly, if a manpower plan exists and is given tremendous publicity, particularly in the technical institutes, colleges, and universities, the individual members of the community will be able to see the range of alternatives that society has to offer them and may be able to plan their own training and research better in the light of such a framework within which their economic opportunities have been identified.

Secondly, there is simply no escape from a major change in the present scale of incentives offered to the scientists and technicians in these countries. In the last analysis, price incentives (along with a sense of idealism and national purpose) are the most powerful weapon in the allocation of human resources. If Pakistan persists in offering its technicians only a fraction of the economic opportunities that it offers to its generalists, it is going to have a shortage of good technicians irrespective of the funds it devotes to scientific training and research.

Selective education. I am also opposed to the present system of open entry to the educational institutions in India and Pakistan. Education in these countries is not a right; it is an investment. The

society is entitled to be selective about this investment and to choose carefully the individuals who are eligible for such an investment. There is no point in clinging to the present, so-called "liberal" concept of education which suggests that everyone is entitled to higher education of any sort, be it history or philosophy or physics. Such a concept is an intellectual luxury which the poorer societies simply cannot afford. I contend that the society has the right, in fact the duty, to plan and to regulate the output of educational institutions and to fix appropriate priorities in the field of scientific training and research and to take all such steps as are necessary to make the preferences of the individual conform to the preferences of the society.

Some Practical Reforms

If there is to be intelligent planning of scientific training and research in India and Pakistan today, it will require a good deal of cooperation between the planners and the ministries of labor and education. We generally find that education is handled by one department, labor by another, and planning by a third. There is seldom a meeting of minds between these various departments. I would like to suggest that labor and education ministries should be merged into one or, rather, that a manpower ministry should be created and made responsible for the preparation of a comprehensive manpower plan, as well as for the regulation of the quality and quantity of education required under the plan. The education and the manpower divisions of the planning commission should be merged and should function as one unit.

Manpower planning is perhaps the most neglected field in both India and Pakistan today; unless enough attention is devoted to it, the planning of scientific training and research will always remain deficient and divorced from national requirements.

Conclusions

The funds being devoted to education in general, and to scientific research in particular, are totally inadequate, but the scientists can make a better case for larger allocations only if they relate their demands to the short- and long-run growth requirements of the system, rather than by making futile comparisons with the Western world. International comparisons of the funds devoted to scientific research, which have been made repeatedly in this forum, are totally meaningless, because practically all activities in these countries, not only scientific research, come out fairly badly when international comparisons are made. This only proves that these countries are at a lower level of development all around, not that they are neglecting one activity more than another.

If any comparison is to be made, it should be made in the light of the national growth requirements. We have heard very little about economic opportunities missed because of lack of adequate funds for scientific research. We have had no evidence placed before us of huge opportunities which could have been exploited only if the society had made more funds available for science. I think that a better case can, and should, be made for investment in scientific training and research in South Asia. Unless that is done, the scientists will keep complaining that the economists do not recognize the priority of scientific research while the economists will keep accusing the scientists of wasted investment.

[Excerpted from "Wasted Investment in Scientific Research," a paper presented to the International Symposium on Science in South Asia, New York, 5-7 May 1966. Proceedings of the Symposium will be published by the Rockefeller University Press, New York, in 1967.]

PROBLEMS RELATING TO THE UTILISATION OF RESEARCH RESULTS

Salimuzzaman Siddiqui

[Research expenditures can be justified only if results are ultimately applied in the economy. The payout period is usually long, but efforts can be made to remove obstacles to utilisation. Some examples from Pakistan are furnished.]

In the application of science to economic development, the most intractable problem that the developing countries are faced with is the resolution of bottlenecks which hold up the utilisation of research results. This, indeed, makes for quite a grave and frustrating situation for the national research organisations of these countries, because there is an increasing insistence that the large funds expended on them should be justified by demonstrable economic returns. Even aside from this compulsion for cost-accounting, applied research appears to be pointless to scientific workers if its results do not get closely integrated with the relevant sectors of economic development.

To cope with this situation, some of the countries have established research-utilisation boards with adequate funds for the promotion of industries based on research in the various applied fields. Such an arrangement may have a certain advantage for countries with highly developed industrial structures, but they seem to be of doubtful utility in those which have a comparatively limited industrial potential.

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Pakistani Experience

From the experience gathered over a number of years under the Pakistan Council of Scientific and Industrial Research (PCSIR), it appears to be of the upmost importance for the conversion of research processes into industrial production that the research groups responsible for them be closely associated with the projects all the way through, from the laboratory work-bench and pilot-plant studies to actual commercial exploitation. According to the procedure followed by the Council, a process worked out in the laboratory is subjected to pilot-plant investigations for establishing its economics and optimum working conditions. In the course of these investigations, the resulting products are sold on "cost-plus basis" to assess the reactions of the consumers to their price and quality. Necessary improvements are introduced in the light of that assessment. Such a procedure, though somewhat protracted, ensures the acceptability of the research products in the market and serves to interest prospective industrialists in their exploitation.

In order to promote the utilisation of its processes by industry, the Council has set up a Research Utilisation Committee on which there is a broad representation of scientists, industrial economists, relevant governmental departments, and development corporations. The offers received from the industrialists in response to public advertisement are scrutinized, and the processes are then leased out to suitable parties against the payment of agreed premium and royalty. Following the allocation of a process, the Council provides every possible assistance in setting up the factory and has, in some cases, actually run it in the initial stages of production with the help of its own technical and engineering personnel.

To give an idea of the extent to which this procedure for the utilisation of research results has succeeded, over 20 processes evolved by the Council since its inception in 1958 have been leased out to industry. These involve a total investment of about 30 million rupees. Some of these processes have already gone into production, while others are expected to reach that stage in the course of the next two years.

This certainly would not sum up to a claim that the PCSIR has made a sizeable impact on the industrial development of the country. But, once a beginning along the right lines is made with the development of processes and products, and once the Council has thereby established its reputation for a down-to-earth, practical approach to science and its applications, it may be able to overcome many of the obstacles it has had to face in putting across some of its larger-scale projects for commercial exploitation.

Difficulties

In the first phase of industrialisation, developing countries have to buy foreign technology at a heavy cost, as has been done by the Pakistan Industrial Development Corporation. It is not fully realised, however, that this cannot be the whole answer. We must invest and invest heavily in scientific and technical research. This research may take a long time to exercise its impact on development, but without it, it will just not be possible to fully harness our human and material resources to that end.

In the present phase of industrial development, industrial entrepreneurs go in for "turn-key" jobs done for them by foreign firms for the manufacture of well-established commodities like cotton textiles, jute goods, and petrochemicals. They are averse to taking up the development of new processes and products evolved by the research organisations of the country. This builds up vested interests, which generally exercise a great deal of pressure against the substitution for imported goods of research products based on indigenous raw-material resources.

The PCSIR is also responsible for solving some of the operational problems of industry which are normally undertaken by research associations in the industrially developed countries. The utilisation of research results in this sector is fairly well assured, and efforts are being made to further strengthen this activity of the Council with the establishment of a full-fledged Industrial Liaison Division.

Some Examples

Against this background of organisational issues involved in the utilisation of research results, it may be appropriate here to cite a few case histories of research and development.

1) As a result of studies of the marking nut (Semi-carpus anacardium, Linn.), it was established that its main constituent is a catechol derivative with a long unsaturated side chain. In view of the fact that this product is closely related in its chemical structure to urishiol, the principal constituent of Japanese lacquer varnish, it was suggested that it might serve as a starting material for the production of enamels and varnishes. This suggestion was reported in a paper published in 1931 and specifically referred to some of the institutions interested in industrial research. However, nothing happened to it until the problem was taken up by the Council in 1940. Within a few months of starting this work, it was possible to establish the use of the material for the production of certain varnishes and stoving enamels. And then, due to the shortage of these materials during the war, the process was almost immediately taken over for development by one of the leading industrialists.

I have chosen this particular example to bring out the close link between pure and applied research, and also to stress the fact that these two aspects of research cannot be relegated to separate water-tight compartments.

2) The first paper reporting the isolation of a whole series of alkaloids from the now famous roots of Rauwolfia Serpentina was published in 1931, but it took nearly 20 years before one of its alkaloids was established as a potent drug in the treatment of hypertension and mental ailments. It is only during the last few years that Ajmaline, the principal alkaloid of the plant, has been increasingly recognised in the treatment of cardiac arrhythmias of various origins. This long time lag between research and development relating to important therapeutic agents has been mainly due to lack of adequate facilities for interdisciplinary research in this field, and also to the lack of entrepreneurial spirit among the industrialists of the underdeveloped countries.

3) One more example will illustrate the handicaps which research organisations of our countries have to negotiate in bringing about the utilisation of research results. Long-range studies under the PCSIR, extending over a period of about eight years, have resulted in a series of chlorinated insecticides based on indigenously available hydrocarbons. Laboratory tests and field trials carried out in association with the Department of Agriculture have shown them to possess the same order of pesticidal activity as toxaphanes. They further have the advantage of extremely low mammalian toxicity, and also of being heavily synergised by the addition of small quantities of some of the more potent pesticides like endrin and gammaxane. The importance of this development to the agricultural productivity of the country may be gauged from the fact that Pakistan has been importing annually about $10 million worth of pesticides, which can take care of barely 10 percent of its plant protection requirements. Nonetheless, this development has been delayed over the years due to vested interests in the import of insecticides, and also due to a certain lack of faith in indigenous research effort.

In this report I have dwelt mainly on the utilisation of research results in the industrial field, because in the agricultural sector there is a fairly well-organised machinery of liaison and extension service under relevant government departments. However, a further strengthening and rationalisation of this machinery is projected under the Agricultural Research Council in close association with the agricultural departments of the central and provincial governments.

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PROBLEMS OF ADVANCED SCIENTIFIC RESEARCH IN DEVELOPING COUNTRIES

Abdus Salam

[Scientific research is important in development, but expensive. However, the critical lack is probably not money for facilities, but isolation from the world research community. International centers could help keep top researchers in their countries, where they could catalyze scientific development.]

Five hundred years ago—around 1470 AD—Saif-ud-din Salman, a young astronomer from Kandhar then working at the celebrated observatory of Ulugh Beg at Samarkand, wrote an anguished letter to his father. In words more eloquent than I could employ, Salman recounted the dilemmas, the heartbreaks of an advanced research career in a poor, developing country.

> "...I love my native Kandhar...and I pine to return. But forgive me, my exalted father, for my passion for knowledge. In Kandhar there are no scholars, no libraries, no quadrants, no astrolabes. My star-gazing excites nothing but ridicule and scorn. My countrymen care more for the glitter of the sword than for the quill of the scholar. In my own town I am a sad, a pathetic misfit.
>
> "It's true, my respected father, so far from home, men do not rise from their seats to pay me homage when I ride into the bazaar. But some day soon, all

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Samarkand will rise in respect when your son will emulate Biruni and Tusi in learning and you too will feel proud."

Saif-ud-din Salman never did attain the greatness of his masters, Biruni and Tusi. But this cry from his heart has an aptness for our present times. We get the story of advanced scientific research and its dilemmas in the developing world of today as seen by those who feel in themselves that they could, given the opportunity, make a fundamental contribution to knowledge.

But there is one profound change from 1470. Whereas the emirate of Kandhar did not have a conscious policy for development of science and technology, the present-day governments of most developing countries would like to foster, if they could, scientific research—even advanced scientific research.

Unfortunately, research is costly. As we have heard, most countries do not yet feel it carries a high priority among competitive claims for their resources. Not even indigenous applied research can command priority over straightforward projects for development. Administrations feel—perhaps rightly—that it is generally cheaper and perhaps more reliable to buy applied science from the world market. The final picture, so far as advanced research is concerned, remains in practice almost as bleak as at Kandhar.

Key Problems

Let us examine some of the factors that affect advanced scientific research. To me, first and foremost, the determining factor for all advanced research is the supply of towering individuals around whom great institutes are built. These are perhaps the 5 percent of all men who are trained for research. What is it that we, in the developing world, are consciously doing to ensure their supply?

To my knowledge, most developing countries are doing practically nothing. Quite the contrary, it is to me astonishing, miraculous, with all the hazards by which a poor society is beset, that any talent at all is saved for science. These hazards are, first, the very poor schooling; second, the civil service which skims off the very top intellect; third, the chancy nature of any opportunities for the extended apprenticeship for research. Add to this the greatest hazard of all; one may or may not be fortunate in getting a position with the few men at the few centres of excellence who appreciate at all the demands of a research career and who run laboratories which are reasonably well equipped.

My thesis is that, in a number of fields, advanced scientific research in developing countries is reaching, and has reached, a stage of first-rate maturity. The indigenous resources are being skillfully employed, but there still is a desperate need for international help. The truth is that, irrespective of a man's talent, there are in science, as in other spheres, the classes of haves and the have-nots; those who enjoy the physical facilities for furtherance of their work, and those who do not, depending on which part of the world they live in. This distinction must go. I believe the time has come when the international community of scientists should begin to recognize its direct moral responsibility, its direct participation in advanced science in developing countries, not only in institutional terms but in personal terms of the first-rate individual working in these countries. I would like to illustrate my remarks with reference to theoretical physics.

Problem of Isolation

Theoretical physics happens to be one of the few scientific disciplines which, together with mathematics, is ideally suited for a build-up in a developing country. The reason is that no costly equipment is involved. It is inevitably one of the first sciences to be developed at the highest possible level; this was the case in Japan, in India, in Pakistan, in Brazil, in Lebanon, in Turkey, in Korea, in Argentina. Gifted men work at advanced centres in the West or the USSR. They then go back to build their own indigenous schools. What has happened in the past is this: these men went back to the universities; they were perhaps completely alone; there was no critical size in the groups they were part of, no good libraries, no communication with groups abroad; they were isolated, and isolation in theoretical physics is death.

This is still the pattern in Chile, in Argentina, in Lebanon, in Korea. In India and Pakistan we have been more fortunate in the last decade. A number of specialized institutes have grown for advanced work in theoretical physics: the Tata Institute, the Institute of Mathematical Sciences at Madras, Atomic Energy Centres at Lahore and Dacca, where a fair concentration of good men has been made possible. But this is not enough. These institutes still are small islands; they still do not have vigorous contacts with the world community. Tata and Madras have partly solved their problem. They have funds to invite visitors, but they have fewer funds to send Indian physicists abroad, mainly because of the very real problem of foreign exchange.

The Trieste Centre

It was with this type of problem in mind that the idea of setting up an International Centre for Theoretical Physics was mooted in

1960. We planned it with two objectives in view: first, to bring physicists from the East and the West together; second, to provide extremely liberal facilities for senior, active physicists from developing countries.

How does the idea work out in practice? We have normal fellowships which are given mostly to those from developing countries. But, in addition, the International Centre has instituted the associateship scheme. A number of senior, active physicists from developing countries are selected; they are given the privilege of coming to the Centre for a period of one to four months every year with no formalities except a letter to the Director. The Centre pays for their fares and their stay. The idea is that we should eventually have a cadre of something like 50 senior, active physicists from developing countries who possess this privilege at any one time. They should choose the timing of their coming, whenever it suits them.

Looking back on my own period of work in Lahore, I felt terribly isolated. If, at that time, someone had offered me the opportunity every year to travel to an active centre in Europe or the USA for three months of my vacation to work with my peers, I would then have been happy to stay the remaining nine months at Lahore. No one made the offer. I felt then and I feel now that this is one way of halting the brain drain, of keeping active men happy and contented within their own countries. They must be kept there to build for the future, but their scientific integrity must also be preserved. By providing them with this guaranteed opportunity for remaining in contact with their peers, we believe we are making a dent in the problem.

Ideally the scheme should be wide enough to cover nearly all active physicists in developing countries. Unfortunately, the International Centre at Trieste does not possess funds to do this.

Briefly, what I would like to see happen is that large institutions may consider setting up their own associateship schemes, not only in theoretical physics, but also in other subjects. A university, for example, could extend the privilege of giving this freedom to most active microbiologists in most developing countries.

The Centre has found that the scheme is not too costly. Since we pay no salaries—only the fare and a per diem—it costs us something like $100,000.

Already the European Organization for Nuclear Research at Geneva has started following a scheme similar to our own, which covers, I believe, both experimental and theoretical physics. It is designed only for developing countries within Europe (Greece and

Spain). If we could succeed in covering every active, first-rate worker in the developing countries, we would go very far in removing one of the curses of being a scientist in a developing land.

I have emphasized the personal problem of the advanced research worker. In advanced scientific research I believe it is the personal element that counts much more than the institutional. If, through meaningful international action, allied with national action, we can build the morale of the active research worker and persuade him to not make himself an exile, we shall have won a real battle.

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PREPARED INDUSTRIAL SITES

THE INDUSTRIAL ESTATE— A DEVELOPMENT TECHNIQUE

William Bredo

[Prepared industrial sites—called "estates," "parks," "districts," etc. —have proved particularly useful both in encouraging medium- and small-sized industry and in attracting foreign investment. They should be considered as part of an overall industrial development policy.]

Many countries are faced today with the urgent problem of industrializing expeditiously and with a sense of orderliness. The capacities of government are taxed in finding suitable means of attaining this aim. Certain institutional devices have been used successfully to deal with the intricacies of initiating and sustaining industrial development and growth, especially as regards small- and medium-scale industry.

The industrial estate is one among several effective devices for fostering new entrepreneurship and orderly industrial expansion, especially in the small- and medium-scale industrial sector.

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It is a focal device around which other institutional means of supporting industry may be effectively deployed.

The industrial estate is a way of planning the establishment of a viable cluster of industrial enterprises. The tract of land developed for the purpose must provide for the basic elements of the internal physical infrastructure, including construction of streets and roads, the installation of water, power and sanitation utilities, and the provision of transportation facilities. Factory buildings may also be provided as a complete package of industrial facilities, or there may be special financial arrangements and technical assistance for factory construction.

An essential provision is sufficient future control of the developed site through such means as industrial zoning, incorporation of legal restrictions in deeds of sale or leases, and arrangements for long-term management—all with a view to protecting the investments of the developer and the tenants.

Industrial estates have been used with increasing success since the Second World War for promoting orderly industrialization in advanced as well as developing countries. Today over 1,000 are in operation in the United States. British experience influenced the founding of the program in India, where today over 100 projects have been established with the specific objective of dispersing industry. In "Operation Bootstrap" of Puerto Rico, the industrial-district concept of the United States mainland was adopted to achieve the twin objectives of attracting industry and achieving decentralization.

Historically, a broad range of goods has been successfully produced on industrial estates. These have included producers' and consumers' goods, with the latter predominant.

Economics of the Industrial Estate

While experience with industrial estates indicates that plants of all sizes are likely to benefit from locating in such projects, the benefits appear to be greatest and most obvious for small- and medium-scale enterprises. The big industrial enterprise, which characteristically has comparatively large resources of finance and skilled administration at its command, can provide itself with many of the tangible and intangible elements that a small enterprise can obtain only as a member of an aggregation of firms. The economic benefits of industrial estates arise to an important degree from the following considerations:

1) the economies of scale obtained from the overall construction, planning, and development of the project;

2) the external economies derived from the physical infrastructure and the clustering of industrial enterprise;

3) the economic feasibility of providing certain services and conveniences resulting from an aggregation of a sufficiently large number of firms; and

4) the benefits from a reduction of risk to the individual firm and the sponsoring authority arising from the clustering of firms.

Large economies of scale can be obtained from developing an industrial estate to provide facilities for a group of industrial enterprises. The major immediate benefits to individual industrialists are derived from:

1) the assembly of land into suitable and well-located industrial sites,

2) the construction of streets and access roads,

3) the installation of power, water and waste disposal systems, and other utilities,

4) the easy financing of construction, particularly if factory buildings are included, and

5) the reduction in the time required to complete preparations for beginning industrial production.

These contributions significantly reduce the cost and promote the ease of getting into business. Benefits also include the spread of technical know-how and skills among workers and management, mutual inspiration, a pool of industrial labor, and the stimulation of many kinds of entrepreneurship. The market becomes large enough also to support certain industrial services, such as common facilities and advisory services. Some services may be provided by private enterprise to take advantage of the ready-made market. The concentration of industries makes it possible to establish substantial overhead facilities, some requiring heavy capital investments, such as railway and port installations or the extension of a highway system. Many services of benefit to employees and businesses, such as improved bus transportation, become feasible due to economies from the clustering of industry. In some cases, where the industrial estate is fairly large, it may be advantageous to locate industrial training facilities close by.

An industrial estate provides the essential element or orderliness in the growth of an urban community by locating firms together in an industrial zone. It has the good effect, through proper selection of industry, of protecting residents from unpleasant industrial odors, noises, dangers, and traffic congestion. In the absence of a zoned approach inherent in an industrial estate, industry tends to become interspersed with other businesses and private residences because it is less costly and more convenient for entrepreneurs as the essential utilities may already be available there.

The Planning Framework

To use industrial estates deliberately as a method of promoting industrialization, a strong institutional framework for planning, executing, and servicing projects is essential. It may be necessary to have a hierarchy of institutions—national, provincial, and local—designed to produce a calculated long-term effect on industrialization.

The program should view comprehensively the integrated development of small-, medium-, and large-scale industry. This relationship must be conceived at the national planning level. Coordination is required among agencies responsible for the development of large and small industry and those in charge of planning all infrastructural investments.

National planning should provide for industrialization of identifiable regions; industrial estates for small- and medium-scale industry may be components of regional industrial complexes. Such planning would enable the agencies concerned with the development of industry and those responsible for the development of the infrastructure to move in step.

The agencies responsible for industrial estates should be administratively strong and adequately served by investigation and planning groups. In addition, strong auxiliary measures, devices, and institutions may be required to serve industry. These include industrial advisory services, community workshops and common facilities, demonstration centers, worker- and executive-training programs, productivity programs, development banks, installment purchasing and supervised credit systems, cooperatives and trade associations, and research facilities. A coordinated approach using such measures simultaneously with an industrial-estates program is likely to produce the best results.

Locating the Estate

The first principle in planning an industrial estate would seem to be to obtain the greatest impact in employment opportunities and

dynamic growth. Secondly, it is necessary to take into account the incremental investment required in the infrastructure (particularly transportation, communications, and amenities) which is an essential and concomitant part of the overall investment.

A desire to assist the less developed, smaller urban centers conflicts with the likelihood that the infrastructure essential for rapid industrial growth may be inadequate in such communities. The external economies, so essential for attracting and supporting industry, may not be sufficiently developed and the chances of commercial failure are much higher. Success is more likely where industry already exists; its existence indicates that external economies may be satisfactory and that there are prospects of dynamic growth.

Cities with a good growth potential need to be identified for locating industrial estates. The growth rate and the ratio of industrial entrepreneurship with respect to the population is a good indication of the dynamics of growth. Large metropolitan centers with strong growth potential probably need no special assistance. On the other hand, in a whole range of cities extending down to perhaps 50,000, depending upon the degree of industrialization, industrial estates can pay off well.

After a strong impetus has been given to cities in the 100,000 to 300,000 population range, it may be feasible to move on to a second tier of smaller cities and towns, ranging perhaps between 50,000 and 100,000 in population. Consolidation around the centers of strong potential should be pursued by the integration of smaller satellite cities and towns, and perhaps even large villages.

Assistance to Occupants

The effectiveness of the various means of assisting small- and medium-scale industry can be extended if intimately related to an industrial-estates program. Among these, much effort should go into providing more technical know-how for the less capable industrialists. Merely to use the estate as a means of subsidizing inefficient small industrial firms is not sufficient justification, unless the means are at hand to assist the small industrialist to improve productivity in the process. In fact, the objective of modernization must begin with the selection of industrialists who have the inclination and capability to modernize and have shown a tendency to do so in their previous history.

Usually, it will be necessary to provide technical advice on selecting modern machinery, developing the plant layout, satisfactorily installing the machinery, and putting the plant successfully into operation. Such assistance may offer one of the most effective

means of improving working conditions by providing sufficient workspace to permit increases in labor productivity. Lack of a properly qualified technical-assistance service at the disposal of an industrial ministry of government could be a real bottleneck in executing a successful industrial-estate program in an underdeveloped area.

Factory Construction Policy

Important problems are whether factories should be provided in advance of demand, and the financial terms and arrangements on which buildings should be made available.

Evidence supports a policy of constructing factories of a few standardized types, as these can meet perhaps 90 percent of the requirements of small- and medium-scale industry. Standardization of design has the important advantages of permitting economical construction, obtaining acceptability from most industrialists, and ensuring reoccupation in the event a tenant leaves.

Construction of some factories by the sponsor of the estate sets the tone for the types of buildings preferred and a standard which private builders may follow.

There are generally advantages in permitting industrialists some choices: whether to build their own factories, having the development agency construct factories to their specifications at cost, or leasing ready-built factories. They should probably have the choice of buying factories outright, buying them in installments, or renting them on a long-term basis. From the sponsor's point of view, the sale of buildings provides an effective means of drawing private capital into the project. Of course, policy must be flexible so as not to force small industrialists to sink capital into fixed assets instead of using it for operations. Buying of factories permits the creation of a revolving fund for reinvestment in phased expansion or in new projects.

Research for Planning

Every industrial estate requires a feasibility study to evaluate the project from economic and engineering points of view, including the goals of the industrial-estate program and the anticipated contributions of the overall economy. Most of the limitations of industrial estates are the consequence of improper planning. The danger is that over-enthusiastic expectations, unbuttressed by the facts needed for making good plans, may result in highly expensive industrial monuments which would divert resources from more productive investments.

The overriding aim should be to establish firms in a position to be competitively viable. Therefore, the location and the design of all aspects of the project need the most careful attention.

There is a need to decide on the regional location. There should be an evaluation of alternative sites within the urban area and the environs where the project is to be established, from the standpoint of cost, access to transportation, availability of raw materials and markets, adequacy of water and power supplies, community facilities, and the like.

Reference has been made to the selection of the city on the basis of its potential. There is also need for an evaluation of the probable impact of the investment on the growth of the community; and alternative centers need to be compared if a choice is to be made between communities. The choice may be affected by the type of industry to be promoted within the framework of a national development plan. A survey of the industry of the area is probably essential for understanding the industrial structure, the kind of industry which may locate on the project, the state of technological art, and what steps need to be taken for modernization.

The Possibility of Foreign Investment

There would appear to be an opportunity to use industrial estates as a mechanism of industrial development in connection with private foreign investment and in rendering foreign economic assistance to less developed countries. Through the clustering of industry, and by the reduction achieved in the administrative burden involved in larger-scale equity or lending operations, the industrial estate makes it feasible to invest from abroad in small- and medium-sized enterprises. The risks can be spread among many enterprises. The administrative costs involving the transfer of a large block of capital (usually the case in international loans and investments) are greatly reduced. Finally, it permits real control over the inherent economic risks by introducing necessary technical and managerial assistance.

[Excerpted from "The Industrial Estate—Social Technology for Economic Development," US Papers Prepared for the UN Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas (UN Document No. E/CONF/39/D/176), Volume IV, Washington (D. C.), Government Printing Office, 1963, US$ 0.55, pp. 86-95.]

PLANNING AN INDUSTRIAL ESTATE

Edward D. Mills

[This article, done originally for the United Nations Economic Commission for Africa Seminar on Industrial Estates in Africa, takes up where Bredo's leaves off—at the point at which a general determination to build an industrial estate has been made. The author describes the elements of a fully considered industrial-estate project.]

One of the most important factors contributing to the success or failure of an industrial estate is its physical location. Following the general determination of location [see Bredo for a discussion of this problem], the choice of a particular parcel of land must be decided by the physical factors of the sites available. Although seemingly unsuitable sites can be successfully developed where special needs and considerations compel this course of action, poor sites generally burden a project with abnormal initial costs to such an extent that the scheme never becomes economically viable and the ultimate objective is seldom realized.

Physical Factors

A site selected for development as an industrial estate should be level or capable of being levelled at a reasonable cost. The subsoil should be stable. Land which may require considerable site works should not normally be chosen, although modern piling techniques, chemical soil-consolidation, large-scale earth moving, and other possibilities are available and can be employed in special cases.

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The shape and size of a piece of land in relation to its development is of particular importance in any tropical region. It must allow the proper orientation of buildings as well as an estate of economic size. Normally, the cost of land is not the largest financial consideration in the total development outlay of an industrial estate, and cheap land which is inaccessible for goods or workers, or likely to entail considerable development charges, is a poor bargain.

Local site investigations are essential before the final choice of a plot is made; these should include test bores to determine subsoil conditions, a site survey to determine levels, and the collection and analysis of relevant data, such as records of earthquakes, floods, abnormal weather, or other natural conditions. All these will assist in reaching a final decision concerning the suitability of the site.

Communications

However advantageous the physical characteristics of a site, if it cannot be conveniently reached by one of the major means of transport, its value is greatly reduced. It may be possible to create new road or rail access, but this will be costly and time consuming.

The type of transport facilities available in any given area will help to determine the type of industry an estate may hope to attract.

Because of its flexibility and economy, road transport is often most suitable for industries concerned with nonbulky raw materials and finished goods. Since industries of this type are often located on an industrial estate, the importance of an adequate system linking the estate to the main centre or a national highway network must be underlined. Good roads to the nearest town are also important to provide workers with easy access to their homes, whether they travel on foot, by cycle, motor car, or public conveyance.

Rail transport is mainly needed by heavy industries with bulky raw materials and finished goods. If sidings are to be linked with the estate, then the railway users should be grouped together to avoid unnecessary rail track and crossings. If a rail spur is not to be provided on the actual site, then easy road access to the nearest railway-goods yard is essential.

In most parts of the world, water transport is still the cheapest method of carrying bulky loads. For certain industries, such as petroleum, flour, and heavy engineering, sites adjoining a deep-water canal or port can offer economic advantages which will often counterbalance any disadvantages. River access can also be useful,

but the possibility of seasonal changes in water level should be examined.

Although the role of air transport in industry is still in its infancy, easy access to an airstrip will grow increasingly important in the future. Already, industrialists in East Africa are finding air transport for sales representatives, executives, and customers an economic proposition; the urgent delivery of smaller goods can well be made at reasonable cost by air. In Jamaica, the Industrial Development Corporation has established its own strip in conjunction with the Kingston industrial zone.

Few sites will have all the communications advantages described, but a survey of the means of access is part of the basic evaluation of any area under consideration.

Services

All industries need services of some sort, and unless an estate is so large that it can conveniently create its own supplies, it must depend on existing sources. The three major needs are electricity, water, and drainage, and if supplies of any of these are inadequate, the success of any industrial undertaking is seriously jeopardized.

Electricity is the principal source of power for most forms of manufacture. If adequate supplies are available from existing power lines, or if new lines can easily be run from the generating plant, this is a great advantage. If existing power plant has to be extended, this will be costly, and the alternative of generation on the site for the benefit of the estate may be worth consideration. High-voltage supply from a national power grid by overhead line to local transformers is the most economical solution. A project such as the Owen Falls hydroelectric scheme in Uganda illustrates what can be done. Interrupted or erratic electricity supplies can dislocate production programmes, and a growing industrial estate will have increasing demands for power which must be envisaged at the planning stage of any new project.

However desirable a site may be for industrial development, a shortage of water can be a very serious drawback. The amount of water required by different industries varies considerably; the chemical industry, for example, uses considerable quantities for production, cooling, and general purposes. Before an industrial estate is planned, careful estimation of possible water requirements must be made, and if supplies are limited, heavy users of water should not be located on the estate.

Land which cannot be drained economically can be a serious liability. Industry needs three types of drainage, which must be kept separate: soil drainage, storm-water drainage, and trade-effluent disposal. Factory estates near large urban areas may well be able to utilize existing sewage systems if they are able to take the additional load. In relatively underdeveloped areas, local facilities may need to be provided for the specific use of the estate. A separate treatment system for soil drainage will be needed, and industrial effluents must be treated by the producing industry before discharge into any sewage system. In areas of heavy rainfall, inadequate storm drainage can be a serious nuisance. If proper drains are not available, roads and even buildings become flooded, causing damage to plant and goods.

Economic Factors

A rural estate may well be dependent upon local raw materials and, to some extent, markets within reasonable distance. An urban estate, with its improved communications, can draw raw materials from a greater distance and send finished goods further afield. Where food-processing units are envisaged, the proximity of the producing area to the processing plant is of importance; for example, the sugar factories of Jamaica are situated near the plantations for obvious economic reasons. Similar factors will apply to plants using minerals and other bulky materials.

To ensure a successful enterprise, labour must be available, and long journeys to and from work should be avoided since they are both tiring and expensive. If a selected site has all the advantages listed and yet cannot draw on an adequate labour force, the chances of success are strictly limited. The creation of new industrial communities with housing and the necessary social amenities is an expensive proposition.

Layout

Good estate planning is vital; inadequate planning is ultimately expensive, inhibiting growth and causing perpetual frustration. Expert architectural and planning advice on the problems of estate layout is a sound investment.

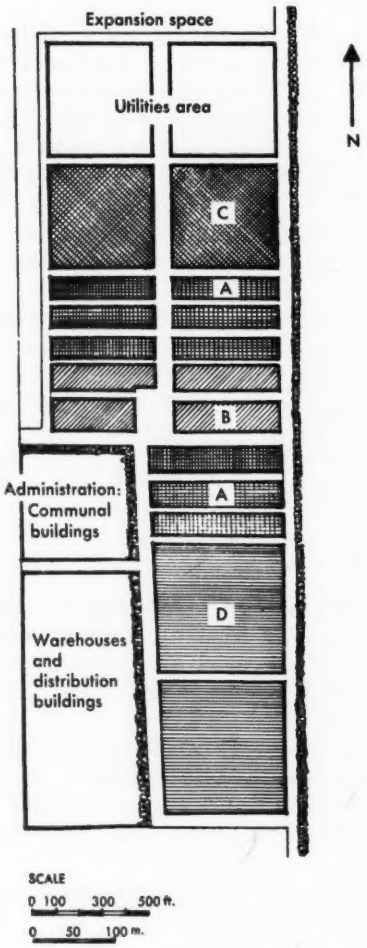
The right relationship of all elements will vary depending on the primary aim of the estate. Such points as availability and cost of land, number and size of firms to be accommodated, and other local and regional factors will determine the general pattern.

Basic road patterns must be determined as a first step to estate layout, and electricity cables, drainage runs, water mains, and

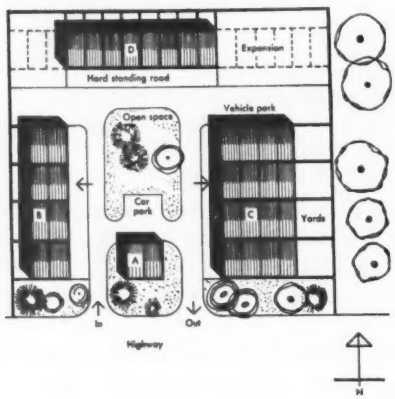
other services planned to follow the road pattern. Such services must be installed at the same time as the road construction to avoid subsequent and costly engineering work. An economic proportion of roads to total estate area is in the region of 25 percent. One-way systems have much to commend them.

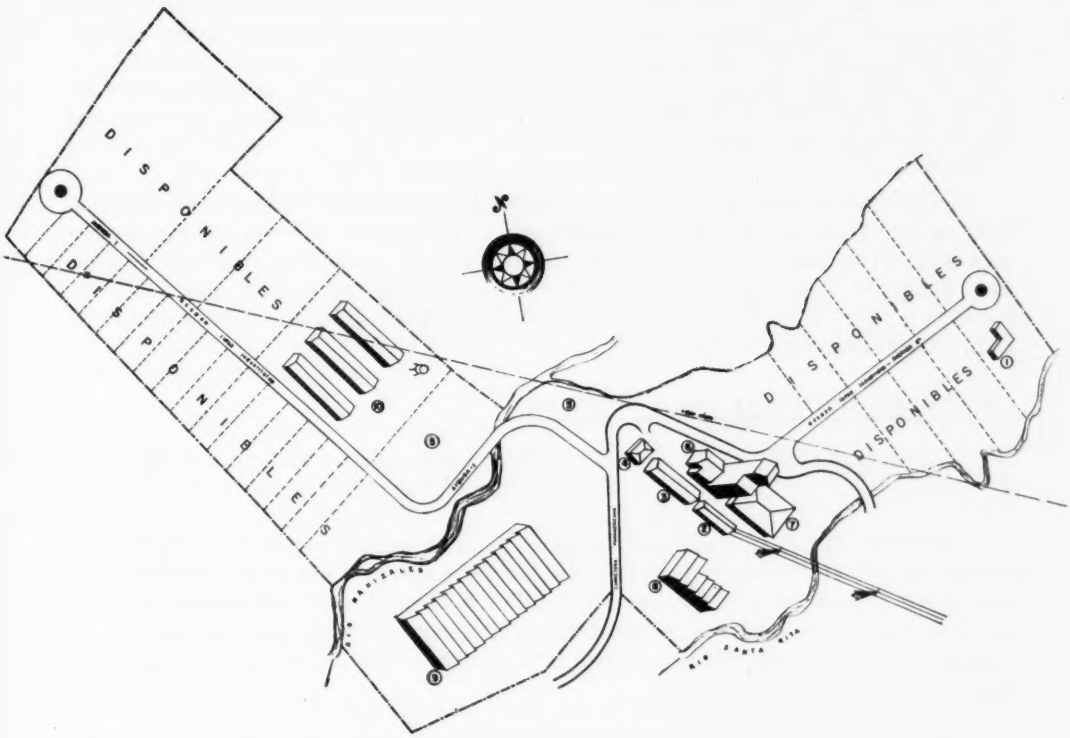
The initial development of a site may not include a complete road system, but the ultimate pattern must be determined at the outset so that growth can be orderly and in accordance with a master plan.

Industrial Estate—Ja-Ela, Ceylon. A) Nursery factories. B) Standard factories. C) Custom-built factories. D) Noncompatible factories.



Diagrammatic layout of small rural industrial group based on 30-ft. x 15-ft. module.
A) Administration and showroom. B) Workshop units. C) Nursery factories. D) Craft units.





Key

1. Aqueduct
2. Electricity and telephone
3. Cafeteria and dispensary
4. Bank and administration
5. Sports and social activities
6-10. Factory buildings

Park in Colombia

"Parque Industrial Malteria" viewed in this schematic drawing is located on a 20-hectare site, dissected by the Pan American Highway and Manizales River, near Manizales where six plants have been installed in the park promoted by La Corporación Financiera de Caldas.

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The car parks and some utilities may well be planned in relation to designed open space, but they are not alternatives to open space. Approximately 10 percent of a site area should be preserved for permanent open space to avoid overcrowding. The preservation of existing mature trees is important, since the shade they give is valuable in tropical countries.

Additional site area for overall expansion should be acquired at the same time as the basic land area. If this is not done, land values will rise and increased costs affect the economics of the project at a later stage. Services must be planned to cater for expansion. Reserve land should also be acquired for the ultimate expansion of nonmanufacturing facilities.

Communal Buildings and Facilities

An industrial estate should provide amenities which would be uneconomic if provided individually by each factory owner.

Where small individual industries are concerned, a cooperative warehouse will allow a manufacturer to rent the amount of storage space he needs at any given time. Such communal warehouses must be designed in a central position, with good access and carefully planned loading facilities. Security against theft and unauthorized entry is vital.

Administration facilities will be required for the proper running of all but the smallest industrial estates. The administration building can be either a simple suite of two or three offices or contain a variety of amenities for communal use. The most necessary of these amenities are canteens and health facilities. The former should provide simple meals in pleasant surroundings away from the workshop atmosphere; the latter may be only a basic first-aid unit (which should be regarded as the minimum provision), but it can be designed to provide more comprehensive medical treatment if the size of the estate warrants it.

Other communal facilities that should be considered for large- and medium-sized industrial estates include a children's creche, rest room, bank, post office, telephone exchanges, and training centre. A trade training centre could well be associated with communal repair and maintenance workshops. A small showroom and exhibition space will be welcomed by the individual tenants, since this will enable them to exhibit their goods to potential buyers in attractive surroundings away from the working area.

The provision of housing and social amenities may have to be considered in certain special cases, but in general it is more satisfactory if an existing community can be expanded.

Design for Expansion

If growth and expansion are not considered, then the success of an industrial estate can be materially inhibited. Growth can be allowed for by the following means: a) provision of adequate land for general expansion; b) initial reservation for expansion of car parks and all communal facilities; c) adequate provision of roads, main services, and utilities; d) sufficient variety of standard factory sizes and prepared sites; e) adequate control of plot coverage ratios and other restrictions; f) foresight in advising tenants on size of plot in relation to ultimate growth potential; g) detailed design of buildings to facilitate extension and modification; h) flexible pattern of transfer from "nursery" factory to standard factory and custom-built factory.

Not all industries on an estate will want to expand, but since one of the merits of the factory estate is the flexibility of accommodation, this factor must underlie all design considerations. The estate must aim at attracting healthy, expanding industries as well as those that need assistance. It is probable that 50 percent of the industries attracted to an industrial estate will grow to some degree in the first five years of their tenancy.

Master Plan

The detailed plan of any industrial estate must be completed before the work is carried out on the site. This master plan must not only lay down the zoning pattern for the immediate development area, but must plan in broad outline the future pattern of growth. The master plan must present on paper, and preferably also in model form, the total layout, the grouping of industries, the allocation of space to communal facilities, and must lay down the directives which will be needed to preserve the visual appearance of the finished estate.

The master plan, detailed layouts, design drawings, details, and specifications must all be finalized before work commences and a comprehensive time-and-progress chart prepared for the whole of the activity: surveys, design, construction, and completion. In this way, the efforts of all concerned can be coordinated, and problems of supplies, information, and manpower can be solved before they occur on site, when time and effort is especially valuable.

Any building program must take proper phasing into account. The erection of elaborate community facilities before any factory buildings would obviously be uneconomic. The rule must be "essentials first." Main roads and essential services always have priority, followed by the central utilities and the factory buildings. Proper

phasing of the development will allow early occupation of at least part of the estate.

Standardization can play an important part in the economics of any project. Standardized interrelated components, which take advantage of the essentially repetitive nature of the buildings and their separate parts, can both lower costs and speed up construction, thus ensuring earlier financial returns. Not only should locally available or readily made materials and components be used, but the range limited as much as possible. If this limited range is well chosen and the individual design is good, the final overall design will have a unity which is visually satisfying and financially advantageous.

Costs

Costs have been discussed in this paper by inference rather than by direct statement. Differences in labour costs, material prices, and other economic factors make it useless to attempt any overall comparison, but this is not to deny the importance of preparing a budget in advance, to be used as a guide by the designers, contractors, and so forth.

Once the building work is under way, a careful check must be kept on the cost pattern; variations, alterations, and changes must not be allowed. If this rule is broken, it is impossible to keep an adequate check on costs, and inevitably the final expenditure will exceed the budget.

Good costing records during a building contract and a thorough analysis after completion can together provide valuable data for future design use.

Legislation

Wherever necessary, the existing town-planning legislation should be strengthened to ensure that industry, whether in estates or as large individual units, is confined to areas zoned for industrial use. Zoning laws should be designed to encourage a good-neighbour policy between industry and other land users. High standards for industrial development can make a relatively close relationship between industrial and residential buildings possible. Zoning must always take into account the need for expansion and the importance of communication.

Industries can be roughly classified, and their effect on neighbouring nonindustrial development estimated, by using three categories: needs, such as transport, labour, space, and utilities; hazards, such as traffic, fire, and explosion risks; and nuisances,

which will include noise, smells, waste products, and smoke. By this means, a zoning pattern can be created so that a proper relationship between industry and both town and country can be established.

Estate regulations must ensure that unauthorized development is prevented and that the estate is properly maintained. By-laws relating to refuse clearance, unauthorized building additions, preservation of landscape, building and road maintenance, smoke and nuisance control, effluent disposal, and approved processes are vital to ensure that the original planning and aesthetic standards are maintained.

Fringe development must also be restricted, especially when the estate borders on a main highway. Unauthorized building outside the estate must be prevented. Shack dwellings, substandard factory buildings, and squatter trading slums can grow quickly on the boundaries of a thriving estate, and, once established, they are difficult to eradicate.

Building construction regulations exist in most urban areas, but have often not been brought up to date. It is possible to find building regulations in parts of Africa which are far more restrictive than those in developed countries. Building regulations should therefore receive regular scrutiny to ensure that they are not inhibiting progress by failing to take into account new building materials and techniques.

In many countries, building regulations are being rewritten, based on "performance standards." These specify what building materials and construction must do rather than what they should be. For example, instead of specifying materials and thickness for walls and roofs, the desired degree of fire resistance, strength, and protection against weather can be set out. This allows freedom of choice among the alternatives available. Such building codes cater for the present and the future and need less frequent revision than normal mandatory ones.

Conclusion

The future prosperity of any country depends to a large extent on the production efficiency of its industry. This in turn depends on the efficiency of the buildings used for industrial purposes and the manner in which they are related to each other and their neighbours on individual sites or industrial estates. No country can afford unplanned factories or badly laid out factory estates. An "industrial revolution" need not leave for posterity squalor, ugliness, and

chaos; these things are difficult to eradicate once established, but can easily be avoided if imagination and skill are applied to the task.

[Summary of "Planning, Design and Construction of Industrial Estates with Particular Reference to Africa," Industrial Estates in Africa, New York, United Nations, 1966, US$ 0.75, Sales No. 66.II.B.2, pp. 19-33.]

THE YABA INDUSTRIAL ESTATE IN NIGERIA

Sayre P. Schatz

[The eight-year-old Yaba Estate is intended to function as a "nursery" for Nigerian small entrepreneurs. Its shortcomings are instructive and point up the need for an overall program of aid to businessmen.]

A "fully packaged" estate like the Yaba Industrial Estate, in Nigeria, provides shell factory buildings and some additional services in addition to public utility services. The Yaba Estate is expected to benefit indigenous entrepreneurs primarily by reducing the capital required of them in starting their businesses. Moreover, transportation, public-utility, and other services can be provided to the clustered occupants of an industrial estate more cheaply and efficiently than they can be brought to scattered firms, for the clustering of the firms enables centralised planning and construction of the facilities. Clustering also permits a number of external economies, e.g., in providing watchmen, maintenance, and other caretaking services.

For these reasons, the establishment of an industrial estate had been favoured by the Nigerian Department of Commerce and Industries since at least 1951. An irregularly shaped 2 3/4-acre tract of Crown land in central Lagos was finally secured, and, after delays caused partially by

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late delivery of building materials and by heavy rains, the estate finally opened on 28 November 1958. The first tenant began operating on that day.

The Yaba Estate is run as one of the manifold activities of the Ministry of Commerce and Industry.

Objectives

Two explicit objectives were formulated. The most fundamental and ambitious may be called the nursery function. After a few years on the estate, tenants should have developed their industries to the stage where they could set up their own factories in one of the new industrial areas planned in the environs of Lagos. New tenants could then take their places, and, in turn, develop to the stage when they could launch out independently. It was hoped that no tenant would stay more than five years.

Another purpose of the Yaba Industrial Estate was to serve as a pilot demonstration of the commercial viability of industrial estates for Nigerian businesses. It was hoped that the estate could be run as a profitable venture, and that its commercial success would lead to the private establishment of other industrial estates. It was originally believed that the Yaba Estate would be self-supporting in its fourth year and profit-earning thereafter.

One might say that there was also an implicit, subsidiary base-of-operations function. A partial aim of the Yaba Estate was to aid Nigerian manufacturing firms by providing them with the kind of well-set-up base of operations which they would not have had the capital to establish for themselves.

Description of the Estate

By October 1962, there were seven blocks of workshop units, all one storey, containing a total of 41 workshop units. An office block was erected for the Ministry personnel who administer the estate. A canteen and kitchen were established to serve meals to the workmen; these facilities are rented to a private operator in the same manner as the workshops. Showers and toilets were also put up. These ancillary services enable the tenants of the estate to avoid expenses that they would otherwise have to incur in complying with the Labour Code in such matters.

A well-equipped engineering workshop has been constructed, operated by the agency responsible for the estate. Its basic function is to undertake special jobs for the occupants of the estate which they themselves are not equipped to handle. In 1958, one observer

commented: "Hitherto when some nonstock part of a machine breaks, a replacement usually has to be obtained from overseas; in future it may be possible to construct the particular part locally and so get the machine back into service far quicker."

While it was the original intention to screen applicants fairly carefully, the fact that the number of applications has been limited has precluded this practice. Only already established firms have generally been admitted. Usually, an Industrial Officer of the Ministry of Commerce and Industry has looked over the quarters and facilities of an applying firm, but no difficult criteria were set up. Almost any kind of industry, except obnoxious ones like glue-making, has been considered acceptable. Tenants can occupy one or more units, and can acquire more spaces as their businesses grow. Each tenant's workshop is separated from the adjoining workshops by removable partitions. The tenant is responsible for installing his own machinery.

While the rental charge after the fifth year of occupancy by any firm is designed to cover what is called the "full economic cost," in the early years it is reduced in accord with the nursery function of the estate. A rent of about two-thirds of the "full economic cost" is charged in the first two years; a higher level is charged for the next three. This increasing schedule of rent is intended to induce established firms to leave the estate and make room for other fledgling businesses.

The term "full economic cost" rent is misleading, however. Several costs properly chargeable to the estate are not included in its bookkeeping costs. First, the Federal Government gives a considerable subsidy to the estate by providing it with a rent-free site. Second, the interest payable on the £75,000 investment is not included in the calculation of costs. [1£=$2.80] Third, the running expenses of the estate are not calculated fully to include the salary of the government Industrial Officer who supervises the estate as one of his major duties, nor the wages of several other Ministry of Commerce and Industry personnel, such as watchmen, employed at the estate. Fourth, as in many industrial estates, a government department (the Public Works Department) is responsible for maintenance of roads and buildings. A notional charge was made for these services in setting the rent scale, but this is said by government officials to be understated. Finally, depreciation is underestimated. On the revenue side, anticipated receipts were overstated, for the original calculations did not make any allowance for uncollectable rent. Thus, "full economic cost" rent falls far short of covering all of the costs of providing accommodations at the estate.

By February 1963, there were 25 firms employing 431 workers, an average of 17 per firm. The number of employees range from four to 60. Four of the firms were engaged in printing and four in garment production; three were in cabinet-making and joinery, and two in commercial art. Other firms were engaged in armature-winding and other electrical contracting, tank and pump repairs and installation, traditional wood-carving, manufacture of mattresses, production of sanitary towels, tyre-retreading, hand production of laboratory equipment for schools, repair of typewriters and other office machinery, mixture and distribution of cosmetic preparations, production of poppies, spray painting, shoe repairs and shoe production. Thus, the Yaba Industrial Estate, like most others, is diversified rather than specialised.

Technical advice and assistance are commonly made available at industrial estates, and the Yaba Industrial Estate is no exception. The Industrial Officer who supervises the operation of the estate tries to provide advice and assistance in the selection of equipment, in factory layout and installation of equipment, and in other matters. The services of the Engineering Workshop are meant primarily for occupants of the estate. Commercial advice and assistance is also offered. Moreover, three firms on the estate have been listed by the Federal Government as Approved Manufacturers, a listing which facilitate sales to government departments and agencies. The Ministry of Commerce and Industry has also attempted to help Yaba Estate tenants by providing accounting assistance, by securing early telephone service for the occupants even though there normally would have been a long delay, and in other ways. Other kinds of advice and assistance—industrial research services, favoured treatment with respect to government loans, special assistance in determining credit sources and credit needs, warehousing facilities, help with recruitment and training of employees—afforded by industrial estates at one place or another are not offered at Yaba.

Problems

A consideration of the experience of the Yaba Industrial Estate during its few years of operations points up a number of problems.

Rent. Rental of land or buildings for manufacturing production has been a difficult and intensifying problem in Lagos. Sites have become increasingly difficult to secure. Land rents have been rising to a level that Nigerian businessmen find difficult to pay. In these circumstances rentals at the estate are a bargain.

Nevertheless, even with the early-year reductions, rent payments for many firms are higher than they would be for the "bush" accommodations they might secure outside. Many tenants have

consistently been behind in their rent. Rent arrears in October 1962 ranged up to periods of 12 months. It was estimated that about half of the firms that had ever been tenants had vacated because they could not pay the rent.

Thus, even though most firms agree that the rent is a bargain, every tenant the writer spoke to complained about the hardship rent payments caused, particularly the increase after the initial two-year period. Complaint was also registered in the House of Representatives, a number maintaining that the stipulated level of rents "will cripple any local industrialist who is a beginner."

The Industries Division personnel in charge of the estate were distressed about rent arrears. They believed that tenants tended to consider rent as one of their last obligations, because they found by experience that it has been difficult for government to enforce prompt payment. The tenants interviewed by the writer agreed, and as a matter of fact stated that the "softness" of the government as a landlord was one of the major attractions of the estate.

Location. A majority of the tenants complained that the location of the industrial estate was a handicap. They believed that they might have attracted customers from among the passersby if the estate had been located on a principal thoroughfare. They wanted the government to counteract this handicap by giving much greater publicity to the firms on the estate, and by helping them sell their products.

Inconvenient location cannot, however, be considered a weighty problem at Yaba. Although the estate is not on a commercial thoroughfare, it is certainly well within the densely populated Lagos metropolitan area. It is in a familiar section, adjacent to the well-known Sabo Market and is easily accessible.

There is another locational problem for some enterprises at the estate. Some firms suffered because they had previously depended on a circle of clientele in the particular areas in which they had been located, and when they moved to the estate they lost the patronage of former customers who found the new location too inconvenient. Firms that are so dependent on the physical proximity of their clientele, however, probably cannot benefit much from an industrial estate, which by its nature requires most firms to move away from their old locations.

Engineering Workshop. The Engineering Workshop has been greatly underutilised. It has tended to operate at less than a quarter of its one-shift capacity.

There appear to be several reasons for this. First, the Ministry of Commerce and Industry had difficulty in securing a competent man to take charge of the workshop, causing, among other things, uncertain delivery dates. Second, many of the firms on the estate, owing back rent, felt that if they should use (and pay for) the services of the workshop, they would be asked why they failed to pay their rent. Third, in setting charges that were estimated to cover fully the costs of workshop services, prices were made too high for most of the estate tenants.

Probably most important, the greater number of tenants on the estate are not industrial enterprises of the kind originally envisaged. Tailors and other clothing producers, printers, commercial art firms, typewriter repairers, shoe repairers, etc., do not have much need for the workshop services; they can generally have their equipment better repaired by going to the original suppliers. Outside orders for workshop services have been limited because the workshop was intended primarily for estate tenants. The Ministry of Commerce and Industry did not advertise the workshop services to the general public, and it turned down requests for work that other Nigerian firms were capable of performing, directing the inquirer to these firms.

The under-utilisation of the Engineering Workshop is a costly problem in both real and financial terms. In a country with a limited stock of capital, it is improvident to allow the excellent equipment of the workshop to remain largely idle. In monetary terms, the current operations of the workshop are carried on at a deficit. One official estimated, in contrast, that the workshop would bring a rent of £2, 000 to £3, 000 per annum if it were leased to a private enterprise.

Aid to tenants. There appear to be serveral reasons for the apparently anomalous situation in which the tenants complain about lack of aid but don't make use of that which is available.

First, the kind of aid offered to the tenants if often not what they most need. For example, both the Industrial Officer at the estate during this writer's last visit and his predecessor were not able to offer any substantial technical aid. This is not a criticism of these officers, whose experience and abilities lay in other directions, but is a reflection of the continuing staffing problems in Nigeria. Even the plan for helping the more successful firms by enabling them to expand their workshop areas simply by removing partitions has not worked as smoothly as hoped. It is only a fortunate coincidence if a firm that needs to expand is located next to a unit that is already, or soon will be, vacant. Consequently, expanding firms at Yaba have sometimes had to split their premises into two separated units.

Second, the conflict about assistance to estate tenants is intensified by sometimes rather extravagant expectations of aid. One tenant, for example, was indignant because his request for a chemical analysis of an imported component was turned down on the grounds that the government department approached was not capable of doing such complex work. Another maintained that government assistance should consist of finding an outlet for (i. e., selling) all of the output he was capable of producing. Many felt that they should get loans without security and without undergoing rigorous investigation of the viability of the project.

Third, some of the tenants' complaints have the look of outbursts of annoyance and frustration caused by the formidable difficulties they encounter in their efforts to raise their income levels.

Finally, the writer believes that another reason for the conflict surrounding the issue of aid to tenants was the gulf between Nigerian businessmen and expatriate officials—the wide gap in communications, in feelings, in attitudes, in understanding of one another. Under these circumstances, it would have been wise for the officials to have gone to greater lengths to assure the tenants of the Ministry's desire to supply whatever advice and assistance it could.

Appraisal

The operation of the Yaba Industrial Estate has produced a number of benefits for the tenants. The provision for easy expansion of workshop space on the premises of the estate has been helpful to some tenants even though it has not worked out perfectly. Rent, as already mentioned, is a bargain. Moreover, the fact that the tenants were able, when financially pinched, to hold off rent payments for months was frequently used by the tenants to ease financial pressures; it was almost the equivalent of having a small interest-free line of credit to drawn upon when needed. It was easier for tenants, although some doubted this, to secure other kinds of assistance from government. Tenancy on the estate was good for the reputations of the occupants. As one tenant put it, when people knew that the firm was located on the Yaba Estate they felt it was a "genuine business." Contacts with foreign and other visitors frequently shown around the estate by the Ministry sometimes produced useful ideas, information, and even business orders. Finally, a miscellaneous group of what were considered minor benefits, such as cleaner and more sanitary surroundings, better facilities for their workers, etc., were mentioned by one or another tenant.

Despite these benefits to some of the tenants, the performance of the Yaba Industrial Estate has been disappointing. As a pilot project designed to demonstrate the profitability of operating similar

estates elsewhere in Nigeria on a private basis the Yaba Estate has come to naught. The estate falls far short of covering its costs.

In its other major function, as a nursery for indigenous enterprises, the Yaba Industrial Estate has been equally disappointing. After four years of estate operation, only two firms had reached the point where government officials felt they might be ready to move out and set up on their own. Government had obtained possible sites for them, but the firms were hesitant about moving, for such a move would be quite expensive for them.

It is only with respect to the subsidiary base-of-operations function that the estate has achieved a limited degree of success. As it has become more difficult for small industrialists in the Lagos area to secure land for their operations, more importance has been attached to the Yaba Estate service of providing convenient workshop sites that meet the requirements of the Factories Act. But, on the whole, it seems fair to say that, in this respect, the estate has been little more than a means of subsidising a limited number of indigenous businesses.

It is now necessary to ask why the Yaba Industrial Estate has produced less than satisfactory results.

Significant savings could probably not have been made in the initial capital investment in the Yaba Estate. An International Bank recommendation for simpler structures than the Ministry of Commerce and Industry had originally envisaged was adopted. The buildings are simple shed-like affairs constructed of cement blocks, and it is difficult to see how further substantial simplifications in design could have been achieved.

Real savings in capital costs could have been achieved if the Engineering Workshop had been excised from the project. However, it would have been difficult for the original planners of the project to have foreseen the gross under-utilisation of these facilities.

In any case, the saving that could have been realised from reduced initial capital costs was rather minor. If the full amount had been passed on to tenants, the benefit would have been too insubstantial to ease significantly the tenants' rent problems.

One may ask whether improvements in current operations could have been effected which would have reduced running costs. Except for the under-utilised Engineering Workshop, it was the writer's impression that the estate was run with reasonable efficiency. Even the tenants, many of whom were quite antagonistic to the Ministry because of rent and other problems, felt that this was so.

Leaving costs aside, we ask whether any other practices might have been adopted which would have made the estate more helpful to the tenants. The suggestion most frequently and vigorously made by the tenants, aside from reduction of rent, was that the government should help the firms with the sale of their output. Measures such as these, however, and practically all of the other measures suggested by the tenants—such as loans without security, special kinds of technical aid, etc. —would involve the government in an expanded programme of aid for the tenants. Such a programme, solely for the tenants (and not essentially connected with their tenancy), would hardly be justified.

Need For Broader Aid To Businessmen

If the foregoing analysis is correct, the lackluster showing of the Yaba Industrial Estate was not caused by deficiencies in the establishment or administration of the estate itself, but was caused by more general factors prevailing in the country as a whole. The Yaba experience seems to show that fully packaged estates for indigenous businessmen are, by themselves, an inadequate means of fostering rapid development of indigenous private enterprise.

However, in the context of a strong overall programme of aid to indigenous business and other vigorous development policies, particularly policies that will generate a strong demand for domestic output, the probable utility of a fully packaged industrial estate is much greater. Accommodation on an industrial estate benefits primarily firms that have reached a level of size and sophistication such that their operations would be significantly impeded if they were housed in low-rent "bush" accommodations. The mediocre showing of the Yaba Estate can in one sense be attributed to the paucity of such firms in Nigeria.

The difference between a traditional Nigerian enterprise and a modern one is so great that even a talented proprietor requires considerable aid if he is to make the leap successfully. The transformation requires an essentially different kind of management pattern. The firm must make the difficult shift from one-man control based simply on direct observation to delegation of authority and a concomitant use of more sophisticated management controls and tools. Substantial help is needed by Nigerian firms if a significant number of them is to become developed enough to benefit from industrial-estate quarters. In countries that have substantially aided indigenous business, particularly through measures that have generated booming demand for domestic products, the necessary entrepreneurs do emerge and previous talk about lack of entrepreneurial capacity tends to fade away.

Thus, while a fully packaged industrial estate has not been able to make a substantial contribution to Nigerian economic growth in the present context of rather limited aid-business programmes and rather leisurely development policies, it appears likely that such industrial estates would perform a useful function if they were part of a more vigorous constellation of economic development policies, including an expanded set of programmes to aid indigenous business.

[Excerpted from "Aiding Nigerian Business: The Yaba Industrial Estate," The Nigerian Journal of Economic and Social Studies, Nigerian Economic Society, Ibadan, Volume VII, Number 1, March 1965, US$ 2.00, pp. 199-217.]

A VENEZUELAN SUCCESS STORY

David M. Ferrell

[Valencia's ZIM is an example of a city-sponsored prepared industrial site designed especially to attract foreign investment. In contrast to many other estates, land is sold rather than rented and factories are custom-built rather than standard.]

Latin America has jumped into the global competition to attract industry, big and small, by readying industrial areas—parks, districts, zones, and estates. Public and private development officials in the Caribbean, Central America and Mexico, and South America are making it easier for expansion-minded investors to locate in their areas.

A prime example of what is now happening in Latin America's economic development can be viewed in the impact of one significant project—the readying of sites for industrial growth in the city of Valencia, Venezuela.

In 1959, Venezuela was riding the crest of a ten-year-old economic boom, stirred by a flourishing petroleum industry, and the national government announced a new policy of industrialization for the country. In Valencia, located 96 miles west of Caracas, some 800 industries had started operations from 1948 to 1958. Ten US firms—Goodyear, Dupont, and Coca-Cola, among others—had invested over $300 million in their production facilities during the decade. Now the city council

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decided to try for a breakthrough. It laid plans for the development of a prepared industrial site—the "Zona Industrial Municipal" (ZIM). The project was laid out on 810 hectares of bushland near the Caracas superhighway shortly after the council's decision. Today, with 27 industrial tenants located at ZIM, the council's hope of seeing a weekly payroll of US$ 800,000 has become a reality in eight years.

Valencia's successful experiment is administered by FUNVAL (Fundacion para el Mejoramiento Industrial y Sanitario de la Cuidad de Valencia), which is managed by a board consisting of three members of the city council, a representative of the local Chamber of Industrial Businessmen, and a representative of the local Lawyers National Association.

Dr. Manuel Garcia G., president of FUNVAL, has described the beginnings of the project:

> "The Municipal Government, being aware of the great industrial activity and the on-coming economic changes of the city, and knowing that natural conditions of that region would not be sufficiently attractive as an incentive for industrialization of that locality, decided to engage in technical planning to establish the ZIM, which would offer public utilities and good location as well as the advantage of urban facilities and the benefit of municipal tax exoneration; all of this would become a model experiment for the future, but at the same time represent a basic standard attraction at present."

Late in 1959, Valencia's city council found its first buyer for ZIM. It sold 42.11 hectares, worth $300,000, to the Ford Motor Company for a new assembly plant. The council used this money, plus its own funds, to attract more industry by providing electric power, opening streets, and digging drainage ditches. Today, added to the list of services are telephones, gas, police service, public transportation, permanent fire-fighting service, and an airport located in the industrial area.

In July 1965, Dr. Garcia outlined some "careful considerations" to be made in preparing and planning projects like Valencia's. He said the project's success was based on four factors:

"1) United Efforts and Objectives. [In the City Council], when there were decisions to be made concerning the industrial zone, the decisions were always unanimously approved, in order to get the project under way rapidly and effectively.

"2) Thorough Examination of Geographical and Economical Conditions. Experience has proved that all the time spent on evaluations and economical, technical, and social surveys of the region were all well worth the effort, and represent a good precaution. The planning of the project was based on reliable facts which we could prove, and which were evidently attractive for industrial investors.

"3) Well-Integrated Project. Our project was thoroughly studied and planned for maximum stimulation, and all projected items which could not be completed in the first stage of the project were carefully scheduled for the second. An integral project is a solution to so many problems that arise when a project is hastily prepared or preparation has not been properly analyzed.

"4) Self-Reliant Enterprise. It is with great pride and joy that we can say that the City Council of Valencia prepared and completed this project completely on its own initiative, working with its own technicians and financial resources. This circumstance constitutes the best moral and economical guarantee that any group of persons could ever build up."

FUNVAL points to statistics to prove the success of Valencia's economic development program:

1) Since 1959, 31 companies have bought some 2.83 square kilometers of land for $2.79 million within the industrial zone.

2) There were 40 large manufacturing industries established in Valencia in 1959. By 1965, there were 73 new manufacturing industries in the city, including those at ZIM, employing 20,000 persons, on a weekly payroll of $844,000.

3) Value of construction businesses in 1963 was estimated at about $8.4 million, not counting the land occupied, and had increased to $16 million in 1964; and to approximately $20 million in 1965.

4) Confirmation of check transactions through the Chamber of Banking Compensation indicated that the dollar volume of checks in 1960 was about $157.3 million. It increased in 1964 to $299.5 million and again, during 1965, to an estimated $355.5 million—an increase of 155 percent in five years.

So far as the industrial investor is concerned, a package deal offered on a prepared site means a valuable saving in the time otherwise required to coordinate the development of services and supporting activities at the site.

The complications involved in locating an industry on foreign soil depend on how much the expansion-planning executive knows about 1) local legislation, labor laws, codes; 2) local business practices; 3) the local plant-construction process; 4) local politics involved in gaining road access to a site; 5) acquiring utility services; 6) nature of land cost; and 7) any hidden cost factors.

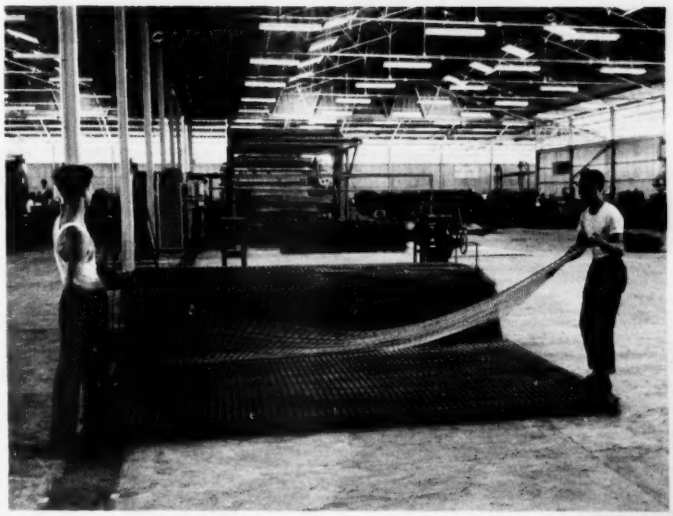
When these time-consuming elements are taken into consideration, it is easy to understand why a prepared site has such appeal to an investor in search of any shortcuts toward plant start-up.

On the other hand, there are possible disadvantages to prepared sites which must be weighed before an investor decides to locate his new plant. Some of these are: "1) initial costs of locating on a prepared site may be higher for some industrialists than would be the case if they developed their own sites; 2) restrictions on land use and accent on aesthetics in industrial parks may limit expansion of some firms unless sufficient land to meet future expansion needs is acquired initially; 3) industrial concentration in parks may lead to traffic congestion and increased labor-union activity; and 4) in areas of labor shortage, competition among industrialists for labor may generate wage and price increases.

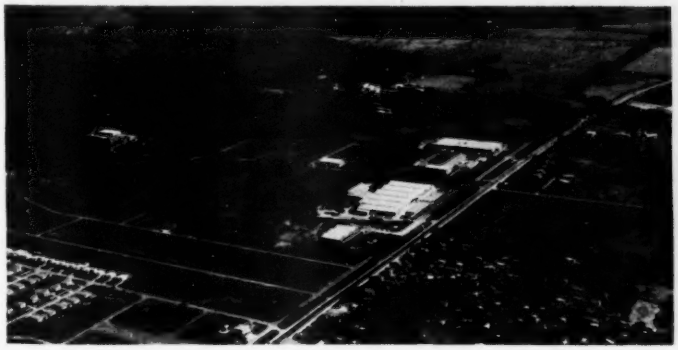
Nevertheless, those experienced in prepared industrial-site development have generally agreed that the benefits of establishing industrial parks, estates, districts, or zones far outweigh the possible disadvantages; and that adequate planning by developers, industrialists, and community agencies can considerably lessen potential disadvantages.

[Summarized from "Building for an Industrial Boom: Latin America Readies Prepared Sites," Industrial Development, Conway Research, Inc., Atlanta (Ga.), June 1966, no charge, 32 pp.]

INDUSTRIAL ESTATES NEED...

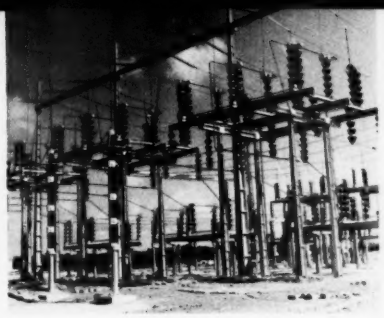


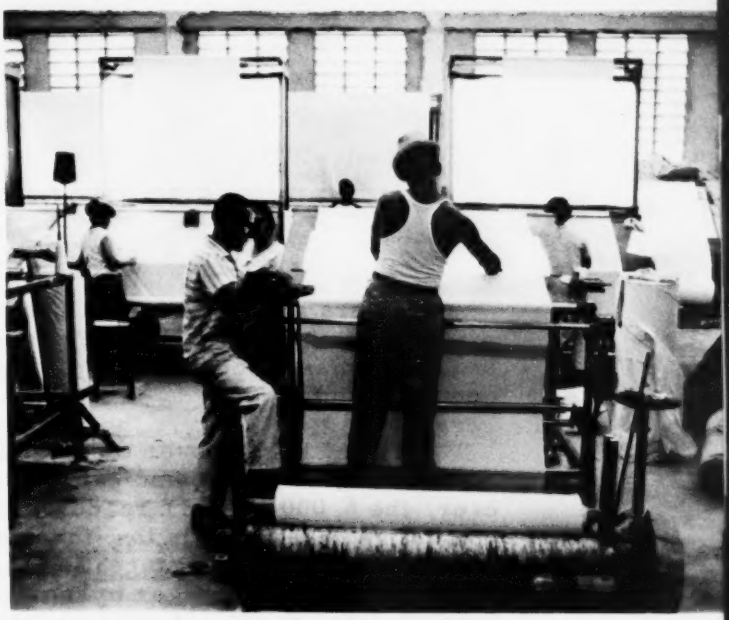
...Factories, either standardized (as above, at Jurong Estate, Singapore) or custom-built (at right, a plant being built in Parque Industrial Santa Lucia, El Salvador.



...Room to expand (left, Twickenham Industrial Park, Jamaica).

...Access by road (top, ZIM, Valencia, Venezuela), rail (center Parque Industrial Santa Lucia), and/or water (below, Oranjestad Industrial Area, Aruba, Netherlands Antilles).





... Power (top, substation, Industrial District, Fortaleza, Ceara, Brazil), labor supply (right, workers at Aragua Estate, Venezuela), and access to markets (below, the city of Valencia and superhighway to Caracas).

(Photos courtesy of Conway Research, Inc., Inter-American Development Bank, and United Nations.)

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USING MILITARY FORCES FOR DEVELOPMENT

Security is, of course, essential to development. Nevertheless, under most conditions, armed forces are not actually used for military purposes very much of the time. Meanwhile, they tie up resources which could otherwise be used for development.

How can the armed forces' resources and skills, especially those of organization and engineering, be mobilized for development? The Iranian Teacher Corps, a cooperative effort in education and community development by the army and the ministry of education, is analyzed by Richard BLANDY and Mahyar NASHAT. A description of work on development projects by Peru's army is taken from Hugh HANNING's book on peaceful uses of military forces in many countries.

THE EDUCATION CORPS IN IRAN

Richard Blandy
Mahyar Nashat

[The Education Corps is run jointly by the Iranian army and the Education Ministry. Young people under military discipline teach in rural areas to complement land reform and village development, and to harness local effort for development.]

The formation of a special army corps of teachers in Iran to spread literacy in rural areas followed the lines of the "community schools," developed in the Philippines and elsewhere. The Iranian Education Corps (Sepaheh Danesh) is a multi-purpose instrument designed to help overcome rural poverty, to reduce the level of unemployment amongst educated youth, and to provide a stabilising influence while far-reaching rural reforms are carried out. It was instituted as part of a national programme which also provided for land and electoral reforms in January 1963. The Corps was closely tied to the Third Development Plan (1962-68), which gives top priority to rural and agricultural development, including education in rural areas.

The land-reform programme consists of the expropriation and redistribution of part of the large estates, and the granting of 30-year leases to the tenant farmers at fixed rents on the remaining land. In addition, provision has been made for village

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cooperatives to be set up as credit, marketing, and purchasing organisations, financed in equal shares by the farmers and the Agrarian Bank, and for a proportional income tax of about 10 percent, payable in cash.

The implementation of the agrarian reform soon made clear that, in the absence of the guidance of the landowners, a leadership vacuum was created that could not be filled by the remaining government authority in the villages (such as the gendarmerie). New government authority and new and better technical expertise had to be found to help the rural people over the leaderless period created by the land reforms, particularly since their success depends on raising agricultural output rapidly to enable the peasantry to retain a surplus. In addition, the success of the rural reforms depends on improved marketing of agricultural produce to reduce the risks attached to loans backed by the peasants' crops and to enable cheaper credit to be provided. Rapid extension of secondary roads and communications is needed.

The social and political reforms have required an understanding of democratic processes by the rural inhabitants. New local leadership has had to be encouraged. Group action and participation in village affairs through cooperatives and other means have had to be stimulated. In particular, the reforms have aimed at emancipating village women to take an active interest and to participate in village political affairs. Participation in all phases of political life, and especially elections at all relevant levels, has had to be made more meaningful for the people. The success of the reforms has depended essentially on an attack on the illiteracy of the peasantry and, thus, on a large-scale infusion of technical help.

However, at the time the reforms were instituted, only 24 percent of Iran's elementary-school teachers were serving in rural areas. Only 24 percent of rural children of school age had a chance to go to school, compared with 84 percent of urban children. The cause of this imbalance could be traced to previous policies which had placed "major emphasis upon the education of urban areas" and difficulties in obtaining rural teachers, because an education tended to be regarded as affording an opportunity to leave rural areas.

While rural development would create conditions more conducive to rural employment for the new middle class of young professionals, one of the conditions for such development is the elimination of illiteracy in rural areas, which requires an adequate supply of teachers.

It was to break through this vicious circle of rural poverty and illiteracy, to fill the rural leadership vacuum, and to combat unemployment among young high-school graduates that the Education

Corps project was launched. Its success has resulted in the adoption of similar schemes in a concerted effort to initiate change and progress in the traditional patterns of rural life.

Corps Operations

The Education Corps programme consists essentially of the use of young high-school graduates, who have been conscripted for military service, as multi-purpose technical assistance workers for the villages, with a high priority given to education. There are no provisions for exemption of these young educated people from military service.

The chief responsibility for the financing, training, and activities of the Corps lies with the Ministries of War and of Education, the former for the initial training period and the latter for the remaining period of service during which the Corpsmen are engaged in work in the villages.

Corpsmen serve the normal period of conscripted service, 18 months. The first four months are taken up in training in both military and nonmilitary subjects, including classroom management, methods of teaching, sanitation, first aid, agricultural extension, rural scouting, community development, and village laws.

At the end of the training period, Corpsmen who pass an examination are qualified for the army rank of sergeant; they are equipped with special uniforms and sent to the villages to serve the remaining 14 months of their term of service. Those Corpsmen who fail the examination complete their normal army service. Although Corpsmen on duty in the villages come under the direct supervision of the Ministry of Education, their whole period of service is deemed to be service in the armed forces, and they are subject to military laws and regulations.

Corpsmen are sent only to villages which have requested their services and which can undertake to provide lodging and, eventually, a classroom. As far as possible, they are sent to villages of their own districts, where they will be familiar with the dialect.

Each group of 20 village schools is supervised by an inspector, who is a graduate of the College of Education with at least five years' experience in elementary-school supervision. Agricultural extension agents, health agents, and cooperative experts also visit the villages at regular intervals to advise the Corpsmen.

Class periods are not rigid, but are arranged at times when most children can attend. Schools are coeducational. The pupils study two

textbooks, which bring them up to a level equivalent to second grade. It is planned to establish schools with four grades in villages easily accessible from a number of surrounding villages in which Corpsmen are working, to permit village children to complete their primary education. Classes number about 40 pupils. Classes for adults are held in the evenings or at other suitable times.

The activities of the Corpsmen are reported in a bi-weekly bulletin devoted exclusively to their accomplishments. Some newspapers in Iran have run special columns on the services of the Corps. Area and regional competitions are organised amongst the Corpsmen and their villages. Area winners (the Corpsmen and the headman of the village concerned) receive prizes.

The Ministry of Education now recruits many of its regular teachers from the Corps. To qualify as regular teachers, ex-Corpsmen must undertake to serve for an additional three years in rural villages before becoming eligible for transfer to urban schools. Almost all who have been accepted for regular teaching positions have asked to be retained in the villages where they have already been teaching. They are given an extra four-and-a-half months' training before their return.

Six groups of Corpsmen have been recruited so far. Since the formation of the Corps, 18, 333 young men have served in villages throughout the country, of whom 6, 930 were assigned in 1965. More than 5, 700 Corpsmen have volunteered to stay on as regular teachers. The present target of 10, 000 recruits per year is to be increased to 15, 000.

An Assessment

The Education Corps in Iran may be seen as a pragmatic exercise in rural educational, social, and economic development. Its outstanding attribute is its integrated approach to rural problems in a developing country. Furthermore, it is conceived with an over-all plan for rural reform and development. Without something like the Education Corps, the rural reform and development programmes in Iran would probably stand small chance of success; but without these over-all programmes as a focus and support, the effectiveness of the Education Corps would also be greatly reduced.

One of the most important aspects of the Education Corps technique in Iran may well be that, at its present stage, it is an army unit. Soldiers have been regarded as an élite in Middle Eastern countries for at least a thousand years, and the mere fact that Corpsmen wear a military uniform rather than civilian clothes appears to have had significance both for them and for the people of the villages in which they serve.

There is no doubt that the Corps movement, and in particular the Education Corps, may bring about a significant change in the attitudes of the present Iranian generation towards the national problems of their country. The young educated man who formerly might have been unable to find a suitable job is now being given, through the Education Corps, the opportunity of learning at first hand his country's problems and of developing a sense of purpose and usefulness to the community. A young Corpsman has described the attitude of the villagers towards him in the following way.

> "... When I arrived in the village of Ghorgh Agha, people first thought I was a gendarme, but when I explained that I had come to teach their children, they expressed great enthusiasm. I was given living accommodation. The people raised funds to repair the school building and make chairs and desks. They wanted to prevent my departure when I was leaving for Teheran...."

Finally, the Education Corps programme, together with the related rural reforms and development schemes, is designed to check the movement of people from rural to urban areas by raising the standards of productivity and life of the rural population.

The technique used by the Education Corps seems particularly well suited to the realisation of its aims, which are primarily educational and economic.

Firstly, the approach of the Corps to rural education is essentially pragmatic. Classes are held at times which fit in with the needs of the rural communities. They are held in any available space—mosques, village houses, or the open air—until provision can be made by the local community for a school building. The curriculum is designed not only to teach reading, writing, and arithmetic but to relate education to the immediate environment. Instruction is given in vocational skills of direct benefit to the village children and their families. Improved hygiene and first-aid methods are taught in an effort to prevent disease. New games and group activities such as scouting, which relieve the monotony of village life, are encouraged among the pupils.

School programmes apply to adults as well as to children in the villages. Literacy classes for adults are held at convenient times. Advice and demonstrations are given on better use of land and water. Methods of road construction with local materials are taught. Assistance is given in organising cooperatives among the farmers so that their small capital resources can be pooled to maximum benefit. Thus, the schools of the Education Corps are truly community schools. The content and techniques of the education provided are tied closely

to the needs and values of the rural communities rather than dictated by stereotyped patterns of educational development. The education is designed to meet the concrete needs of the local community.

The expansion of education on these pragmatic principles clearly has a great potential. It is so intimately related to its rural environment that there is some hope that this kind of education may not encourage the emigration to the cities which has often been the consequence of rural education. The education given in community schools not only raises the expectations of the people, but indicates possibilities for a better rural life at the same time.

Secondly, the Education Corps technique has made a major contribution to the solution of the problem of getting teachers for rural schools. The reluctance of educated people to serve in rural areas can be well appreciated, but only by an initiative of the urban educated is rural development possible. However, the creation of the Corps appears to have had some effect in breaking down resistance to working in rural areas. For example, many young high-school leavers have sought to volunteer for service in the army with the intent of serving in the Education Corps, although they have not been of conscription age. It appears, therefore, that conscription may no longer be an essential feature of the scheme.

Another reason for the breakdown of resistance to teaching in rural areas is that entry into regular teaching is open to Corps members. It appears, however, that the ex-Corpsmen who volunteer for further teaching sometimes do so as a means for entering urban teaching. Since the availability of urban teaching positions is not likely to expand as fast as the need for rural reachers, in the long run, pay and conditions for teachers in rural areas would have to be made more attractive for the supply of recruits to be maintained.

Thirdly, the Education Corps technique has harnessed local resources to the educational effort far more than before in rural areas. In the first year of operations, buildings costing US $2 million were built for the Education Corps programme which could have been provided by the government only at three times that cost. Free contributions of work and materials for school construction by local communities have been considerable. This suggests that the kind of education offered by the Corps programme is more highly valued by the villagers than is more conventional schooling.

Fourthly, the Education Corps technique has made considerable use of expert advice from school inspectors, health officers, cooperative and extension agents. Each Corpsman is visited at frequent and regular intervals by these experts, who help to solve the more difficult problems. In a sense, the Corpsman becomes the day-to-day link between the villagers and technical expertise.

Thus, one of the principal factors making for the success of the educational programme of the Corps is the strong connection between this programme and the economic needs and abilities of the villagers. The Corpsmen are called upon to serve as agricultural agents, health advisers, road engineers, and organisation experts, as well as teachers. The villagers are willing to contribute resources to this programme because they reap considerable benefits from it.

The Corps and Urban Unemployment

There is one economic aspect of the programme entirely separate from the educational objectives, however. This is the problem of providing work for the educated urban unemployed.

A number of countries have "make-work" schemes for idle urban and rural youth, which usually involve physical work in creating national assets, such as building roads, dams, and irrigation systems. Criticisms have been made of some of these schemes on the economic grounds that: 1) they involve high public cost; 2) they divert scarce capital and administrative talent from more urgent development tasks; 3) the use of machinery and more experienced labour would reduce their costs; 4) there is little specialisation or differential reward for work done, so that there is little incentive for the youths to improve their performance; 5) there are problems in finding continuous work that has meaning within the general development of the area; 6) school-leavers kept for very long periods in such schemes would be better recruited into central and local government service.

The Education Corps would seem to be free from these drawbacks. The public cost of the Corps is low in comparison with conventional rural primary education. The capital requirements of the programme are small and are largely obtained at the local level. The administrative talent used in the programme is diverted partly from untapped reserves of talent in the standing army, so that it can be concentrated on one of the most urgent development tasks facing the country. There is little place for the use of machinery, while more experienced labour could not be made available except at greatly increased cost. Supervision by experienced people is strict. Differential rewards for work done are incorporated into the scheme through cash and public awards for outstanding service. The Corpsmen are part of the government service, and, most important, they have the opportunity and encouragement to continue their work on a career basis in the government service as teachers. Continuity of employment, which uses the talents and

the training gained by the Corpsmen, is an essential part of the scheme, so that the training and work experience they receive are not wasted when they leave the Corps, but lead on to continuing teaching opportunities.

[Excerpted from "The Education Corps in Iran: A Survey of Its Social and Economic Aspects," International Labour Review, International Labour Office, Geneva, Volume XCIII, Number 5, May 1966, US$ 0.60, pp. 521-529.]

THE PERUVIAN ARMY AND ECONOMIC DEVELOPMENT

Hugh Hanning

[The Peruvian army is participating in economic development through road building, colonization, and provision of health care and vocational training.]

The primary function of military forces is to guarantee the security of their countries. Peru's armed forces have undertaken activities which show that they view security in its broadest context—the internal strength and well-being of the country. Several of their undertakings, nonmilitary in nature, contribute to Peru's economic development.

Development Roads

Opening up the fertile jungle lands on the eastern slope of the Andes has long been a logical ambition of the Peruvian peoples. This area comprises over 60 percent of Peru, but contains only 12 percent of its population. Much of it is rich, but most has never been completely explored.

A prerequisite to development is the colossal task of driving roads through the mountains to connect the eastern seaboard to the Amazon Basin. A major penetration-road construction and maintenance effort is being carried out by government forces: six army engineer battalions and one engineer company, reinforced with civilian personnel from the

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Ministry of Development. Other army units provide logistic training and support. These units, which are assisted by US AID technical support and by equipment loans, are building roads over the Andes Mountains, are opening up promising areas for colonization, and are working on parts of what will some day be an international highway through the upper Amazon Basin. In 1964-65, 80 miles (130 km.) of new road construction and 475 miles (765 km.) of road maintenance were assigned to the army.

Colonization

One of the most striking by-products of this road program has been the spontaneous colonization of adjacent land. This is particularly facilitated by the army's practice of leaving behind old construction camps, into which colonists move the moment they are evacuated. These often form the nuclei of new towns.

The problem is that, while millions of Indians live in terrible hardship in the high Sierras, there are large expanses of good agricultural land on the other side of the Andes, in the high jungle region along their eastern slopes. But, even granting the opening up of communications, the problems are colossal. For one thing, the climate is dramatically different, in some ways unhealthier. Highlanders are frightened of the unfamiliar jungle, not altogether without reason. Many have doubts that settlers will be anxious to come from the Sierras and from the poverty-stricken barriadas around the larger towns, even given the terrible pressure of population in these areas.

In 1964, the Army Colonization Office was set up by 10 officers who had received specialized training in Israel. Detailed, on-site studies have been made of three colonization areas assigned to the army. Two colonization nuclei should be in operation by 1966.

Projects will vary from 150,000 to 200,000 acres (60,000 to 80,000 hectares). Military units of 300 specially trained volunteers will initiate the settlements. The army will establish a center and will develop four quadrants, each for 300 families, in turn. Under the tentative schedule, after four and one-half years, the project will be turned over to the civilian land-reform agency (Oficina Nacional de Reforma Agraria). Discharged soldiers will be encouraged to stay on as civilian colonists.

The plan of campaign consists of three stages:

1) collection of basic information: high-level reconnaisance (10 days); decision on zone; reconnaissance of technicians (55 days); decisions about nucleus, access roads, etc.;

2) planning project: formulation (140 days); further reconnaissance (15-30 days); develop preliminary project (30 days); develop final project (90 days);

3) execution of project: contracting (with private business or army); implementation; recruiting colonists and training them; coordination, administration, norms, regulations; information, education, training plans; commercialization of products.

Health

The Army Health Assistance Plan brings medical supplies, instruction in preventive medicine and hygiene, and health care to isolated communities and outlying suburbs. In 1964, the target was medical care for 72,000 patients, dental care for 60,000, and the operation of 13 fixed and 7 mobile medical posts.

Vocational Training

The Peruvian army has five vocational training centers where soldiers can be trained for the three months prior to their return to civilian life. Centers were constructed by the army, with some assistance from the United States. In the two and one-half years prior to 1965, 3,800 servicemen were trained in these centers, and the army plans to expand capacity in order to discharge 6,000 to 8,000 semi-skilled workers per year into the civilian economy. Considering the size of the Peruvian army—about 30,000—the proportion involved in this form of training is remarkable.

Existing and projected centers offer courses in carpentry, masonry, electricity, iron work, plumbing, painting, farm equipment operation and maintenance, animal husbandry, fruit and vegetable growing, food preservation, and care and repair of heavy equipment. Instruction, 80 percent of it practical training, is given by civilian instructors who are journeymen in their trades with over 10 years' experience.

Another army program aims at getting recruits to pass on the literacy which they have often acquired while in the army to the people of their villages. Prizes are offered to ex-servicemen who instruct 10 new literates.

It is too early to judge the effects of these vocational and literacy training efforts. The vocational skills acquired by trainees are obviously in demand in the modern sector of the economy, and they have no difficulties finding jobs. Many, however, prefer to return to their

native villages. There is, as yet, no way of knowing whether their newly acquired technical skills and literacy will provide the stimulus for change in rural areas or whether they will be lost in the traditional milieu.

[Summary of a chapter from The Peaceful Uses of Military Forces, New York, Praeger, forthcoming.]

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